



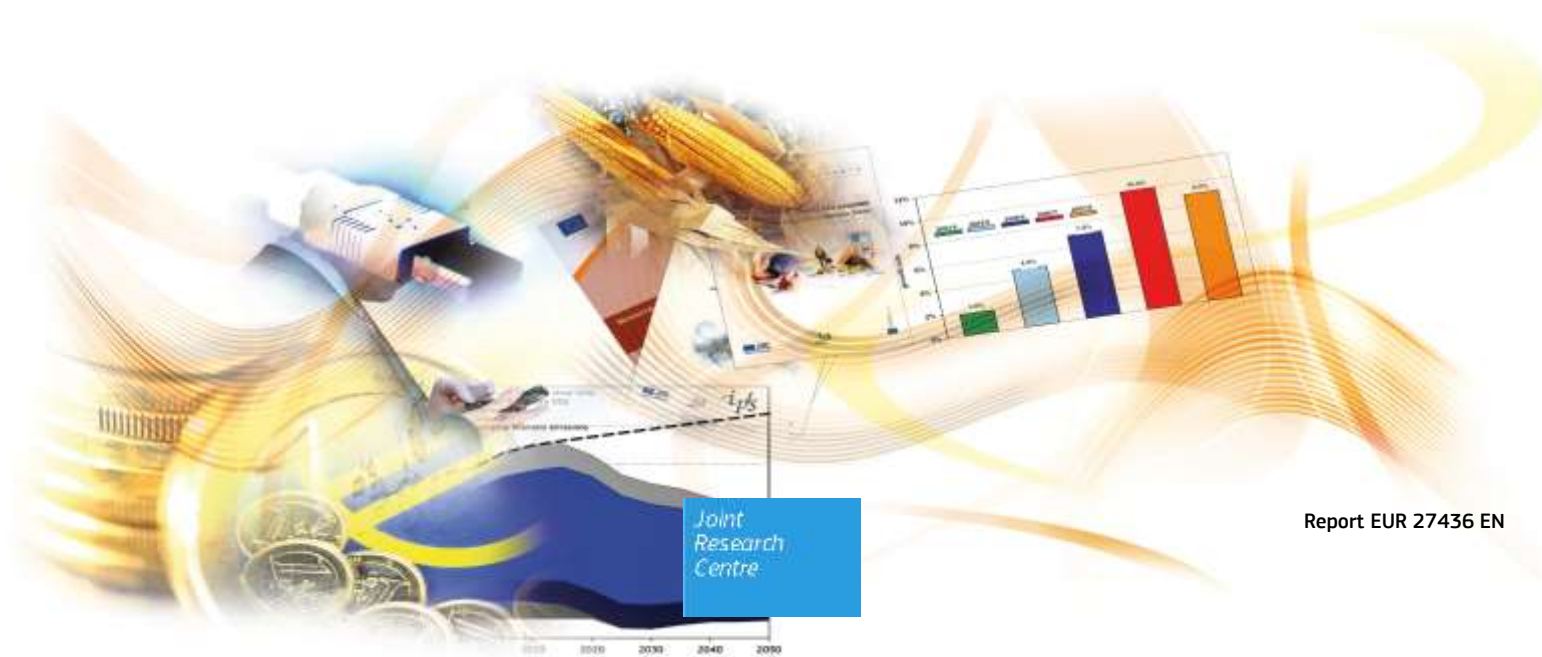
JRC SCIENCE AND POLICY REPORT

Stairway to Excellence Country Report: Slovakia

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Abstract

In the frame of the Stairway to Excellence project, complex country analysis was performed for the EU MS that joined the EU since 2004, with the objective to assess and corroborate all the qualitative and quantitative data in drawing national/regional FP7 participation patterns, understand the push-pull factors for FP7/H2020 participation and the factors affecting the capacity to absorb cohesion policy funds. This report articulates analysis on selected aspects and country-tailored policy suggestions aiming to tackle the weaknesses identified in the analysis.

The report complements the complex qualitative/ quantitative analysis performed by the IPTS/KfG/S2E team. In order to avoid duplication and cover all the elements required for a sound analysis, the report builds on analytical framework developed by IPTS.

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EXECUTIVE SUMMARY

Current system of governance of research, development and innovations (R&D&I) is a major bottleneck for participation in FP7/Horizon 2020 and the absorption of SF/ESIF. Slovakia has one of the poorest R&D&I systems in Europe, but has a surprisingly high number of public agencies. Governance of the R&D&I is split between the Ministry of Education, Science, Research and Sports (MESRS) and the Ministry of Economy.

National research and development policies are drafted, implemented and co-ordinated by the MESRS. The MESRS manages as much as five research funders. The MESRS co-operates with other ministries (Ministries of Economy and Finance in particular), the Slovak Academy of Sciences, higher education institutions, and associations of employers, and industrial research organisations, respectively. The Ministry of Economy manages three research and innovation agencies. There is a substantial disparity between schemes funded from the Structural Funds and those funded from national resources. Agencies implementing Structural Funds tend to have budgets of an order of magnitude higher than those from the national resources. Schemes funded from the national resources, however, account for a notably higher flexibility and much lower administrative burden. The result is that there is very little synergy built between the Structural Fund schemes, which mostly support research infrastructure or applied research, whilst the national schemes support basic and applied research from national resources. The department-based system of R&D&I support creates barriers between the different phases of real innovation projects. The Smart Specialisation Strategy (RIS3) envisages merging incumbent eight research and innovation agencies to two: agencies directed by the MESRS should merge to the Research Agency, while agencies directed by the Ministry of Economy to the Technology Agency. None of these plans were implemented by mid-2015.

The Operational Programme Research and Development (OPRD) has been major source of support to Slovak R&D system in 2007-2013/15. It allocated €1422m to programmes supporting building / reconstructing research infrastructure, excellent science and knowledge transfer. Support by the OPRD actually was higher than the total national support to R&D from public resources in Slovakia in period 2008-2013 (€1273m). Underdeveloped and undernourished R&D system coped with serious problem of absorption capacity of the EU funds. As to speed-up the OPRD spending, the MESRS launched five calls for science and technology parks in the Bratislava Region (€224.74m) and five mirror calls in the non-Bratislava regions (€336.46m) from June 2012 to October 2013. The calls supported building seven University Science Parks and six Research Centres. All these projects must be completed by end of 2015. Some 69.8% of total OPRD means was spent by April 2015.

The analytical part of the RIS3 document noted that the OPRD lacked a good-quality implementation strategy, created an extremely high administrative, fragmented support to large number of small-scale projects and displaced FP6 and FP7 funding. The OPRD funding was relatively easy to obtain, but accounted for extremely high levels of paperwork, giving certainty but reducing the capacity of those skilled in bidding to simultaneously bid for Structural Funds. Many research institutions and HEIs concentrated on the OPRD projects and therefore skipped FP7 applications,

Slovakia ranked to the poorest performers in the FP7 projects. Data from the ECORDA database indicate that Slovakia won 480 project participations and obtained only €77.77m (as of September 2014). Average success rate was 17.9% for Slovak participants (EU28: 20.9%). Major push – pull factors for R&I performers to participate in FP7/H2020 by Slovak research bodies include: (i) underdeveloped and undernourished national system of research and development, and low levels of excellence of the research base; (ii) principles for block and competitive funding for public research bodies, which favour mass education and discourage excellent research; and (iii) competition of the FP7/Horizon 2020 funding with the OPRD resources. There was a clear link between excellence in research and ability to tap the FP7 funding. Rates of success by the Slovak public research bodies in FP7 copied those by SCIMAGO rankings. Effort put to excellent research did not pay for most Slovak HEIs. Institutional funding provided substantially higher source of income than the FP7 projects for the Slovak HEIs. Criteria for institutional funding (high numbers of students, easy-to-pass accreditation and influx of low-quality publications) also were much easier to pass than criteria related to research excellence in the FP7 projects.

The Slovak Republic created some support structures for participation in the FP7 projects. These structures, unfortunately, received meagre funding. The support structures for FP7 also were unable to overcome some generic problems with research excellence in Slovakia.

The Slovak R&D&I system accounts for underdeveloped innovation culture. The national funding agencies all use a peer review process, including at least one foreign-based researcher, even where the grants are for few

thousands euros. Conversely, Structural Fund projects invested billions of euros, but were evaluated by domestic evaluators only, and often more with an eye to allocating their budgets than to the requirements of international scientific excellence in planning period 2007-2013/15. The peer review system for the Structural Funds changed in planning period 2014-2020: all ESIF projects must have at least one international referee. The National Audit Office (NAO) examined 'system evaluation and selection, and transparency, non-discriminatory arrangements, and fairness' in six calls launched by the ASFEU in period 2009-2012. The NAO report found (i) no procedures for drafting shortlist of project evaluators in the Agency for Structural Funds (MESRS); (ii) high fluctuation rates of the ASFEU staff; and (iii) poor evaluation criteria and procedures.

All the OPRD Policy Measures contained references to 'support to excellent science' and/or 'co-operation with the EU institutions'. Terms of reference and evaluation criteria, however, gave low weight to excellent science and/or synergies with the FP7 and other ERA activities. Most investments under the OPRD aimed at the infrastructure building and concentrated in 2013-2015. Results of these investments are yet to be seen. The OPRD Policy Measures 2.1/4.1 and 2.2/4.2) explicitly aimed at building Centres of Excellence, R&D centres and Competence Centres set high targets in terms of publications in the SCI/SSCI journals. The 2013 Annual Report on the OPRD found these targets over-ambitious. The take-up of public sector research results by businesses was supported by the OPRD and the Operational Programme Competitiveness and Economic Growth (OPCEG). Efficiency of the take-up of public sector research results seems low. The Priority Axes 2 and 4 of the OPRD set cumulative targets the EPO patent applications and numbers of spin-offs. The 2013 Annual Report on Implementation of the OPRD stated, there was no EPO patent application and no spin-off reported by the project holders. The OPCEG Policy Measure 1.3 'Support to innovation activities in enterprises'. The applicants were expected to co-operate with public research institutions. Efficiency of policy instrument is difficult to assess, as most project were still running by end 2014, but the overall efficiency seems low.

The Slovak NUTS II regions account for slow spending rates by the Structural Funds. The Stredné Slovensko and the Východné Slovensko (NUTS II) Regions were the poorest parts of the Slovak Republic and accounted for the lowest spending rates by 30 April 2015 (50.0% and 46.5% respectively). The Západné Slovensko and the Bratislava regions were the most developed parts of Slovakia and accounted for slightly higher spending rates (51.8% and 59.9% respectively).

The most important policy suggestions include:

- *Improving quality of governance.* The new governance system needs urgently to find a way to address problems of co-ordination of R&D&I policies.
- *Supporting excellent science.* Current system of block institutional funding discourages excellence and promotes mediocrity. The criteria for block grants to public HEIs should change in such way, as to favour high-quality publications over numbers of students and/or mass production of low quality publications.
- *Improving evaluation culture.* National and ESIF projects with higher budgets should use international peers only, as to limit potential conflict of interest.
- *Enhancing the synergies between the ESIF and Horizon 2020 projects.* Synergy with the ERA activities should not be optional, but compulsory. Evaluation criteria for projects implemented under the national grants and the OPRI should give substantial weight to actual experiences with the FP7/Horizon 2020 and other ERA activities.

1. INTRODUCTION

Background of Stairway to excellence project

The European Commission Framework Programme (FP) for research and technology development has been vital in the development of European knowledge generation. However, there is considerable disparity across EU countries and regions in terms of FP participation and innovation performance.

Horizon 2020 will continue to provide funding on the basis of excellence, regardless of geographical location. However, it will also introduce novel measures for "spreading excellence and widening participation" by targeting low Research & Innovation (R&I) performing countries - most of whom are eligible for innovation funding under Cohesion Policy for the period 2014-2020.

In addition, the new regulations for ESIF aim to use funds more effectively to build regional/national excellence and capacities. By doing so, the two funding sources (ESIF and Horizon 2020) can complement one another along the entire innovation process.

Objective of S2E

The Stairway to Excellence (S2E) project is centred on the provision of support to enhance the value of two key European Union (EU) funding sources for research, development and innovation (ESIF and H2020) by actively promoting their combination. The project has two main objectives, namely:

- Providing of assistance to regions and countries that joined the EU since 2004 in closing the innovation gap, in order to promote excellence in all regions and EU countries;
- Stimulating the early and effective implementation of national and regional Smart Specialisation Strategies.

Main purpose of the document

The main aim of this document is to draw the European profile of a territory (region or country) with statistical and financial information coming from the EU 7th framework programme and Structural funds dedicated to Research and innovation during the previous financial period (2007-2013). Other information is used in support of this aim. The document is guided by the following questions:

- What the overall position of the Region within the country in terms of FP7 budget captured and Structural funds dedicated to R&I managed at regional level?
- What are the specialisation areas emerging from FP7 participation? Are they corresponding with areas chosen in the smart specialisation strategy (S3)?
- What are the main R&I stakeholders involved in EU programmes? Is there a regional specificity compared to national and European level?
- What are the main European collaboration axes of the Region in the EU framework programme?

The document should provide to national authorities and the European Commission relevant and useful information to facilitate the creation of synergies between structural funds dedicated to research and innovation and the Horizon 2020 programme.

The document is divided in four sections: (1) the keys messages coming from the direct interpretation of tables and figures provided in the following sections, (2) the main regional characteristics, (3) the regional specialisation areas, and (4) the Characterization of regional organisations participating in the FP with the identification of the key regional players and the main European organisations collaborating with the region.

Complementarity with other analysis

This document contains key messages only based on the presented quantitative indicators. This "facts and figures" document provides as full a picture as possible of how and where European funding dedicated to R&I is spent in UE13 territories. Within the wider context of the Stairway to excellence project this work complements other analyses to give further insights into R&I funding in EU13 and related issues. Such complementary work includes:

- National profiles based on the input of country experts giving an updated picture of the strategy and governance at the national level.
- Knowledge flow analysis including the use of various types of indicators such as patents, bibliometrics, and FP/H2020 participations.

- Case studies giving examples of success stories of existing synergies between ESIF and other types of funding from across Europe.

The document will also provide background and context to workshops and meetings organised at the national and regional levels.

Source of information

The regional macro-economic indicators are provided by Eurostat. Regional specialisation areas and structural closeness are extracted from the S3 platform. The FP7 related information comes from the last updated FP7 contracts database (June 2014) provided by DG RTD J5. The information about ERDF is provided by DG REGIO database.

Disclaimer

This document aims to give an instantaneous picture about the expenditure of EU funding at NUTS 2 level but it is NOT a monitoring report. Some gaps may occur in indicators without calling into account the key messages provided at the beginning of the document.

2. QUALITY OF THE GOVERNANCE

National system of R&D governance

National research and development policies are drafted, implemented and co-ordinated by the **Ministry of Education, Science, Research and Sports** (MESRS). The MESRS co-operates with other ministries (Ministries of Economy and Finance in particular), the Slovak Academy of Sciences, higher education institutions, and associations of employers, and industrial research organisations, respectively (Figure 1).

The MESRS is responsible for policy- and decision-making in the field of R&D. The ministry uses a range of methods and instruments for policy making and co-ordination. The MESRS in particular:

- drafts and consults all R&D and S&T policies with most important R&D policy stakeholders;
- regularly evaluates the performance of state-funded R&D support schemes;
- prepares final and interim reports on the performance of the S&T strategies and policies;
- drafts 'Annual Report on R&D' – a comprehensive information about public R&D policies implemented in Slovakia;
- sets and implements principles for block and competitive funding of the higher education institutions (HEIs);
- provides organisational, administrative and financial support to the Accreditation Commission for the higher education institutions.
- manages network of funding and implementing agencies (VEGA, KEGA, Research and Development Agency), and professional support agencies (Slovak Centre of Scientific and Technical Information, SCSTI)

The MESRS also provides administrative support to the most important body for co-ordination of S&T and innovation policies – the Slovak Government Council for Research, Development and Innovations (SGCSTI). The body was established via the Slovak Government Resolution No. 620/2011 of 28 September 2011. The SGCSTI is chaired by the Prime Minister and has 34 members. It includes several ministers, chairman of the Slovak Academy of Sciences, president of the Slovak Rector Conference, and also representatives of employer associations and R&D associations. The Statute of the SGCSTI states that the body is 'a permanent professional, advisory and co-ordinating body of the Slovak Government for science, technology and innovation'. The body 'discusses and evaluates mainly conceptual, strategic and financial plans in science, technology and innovations designed for the Slovak Government, European Union bodies and international organisations'. The SGCSTI discussed the most important Slovak documents on R&D policies, such as:

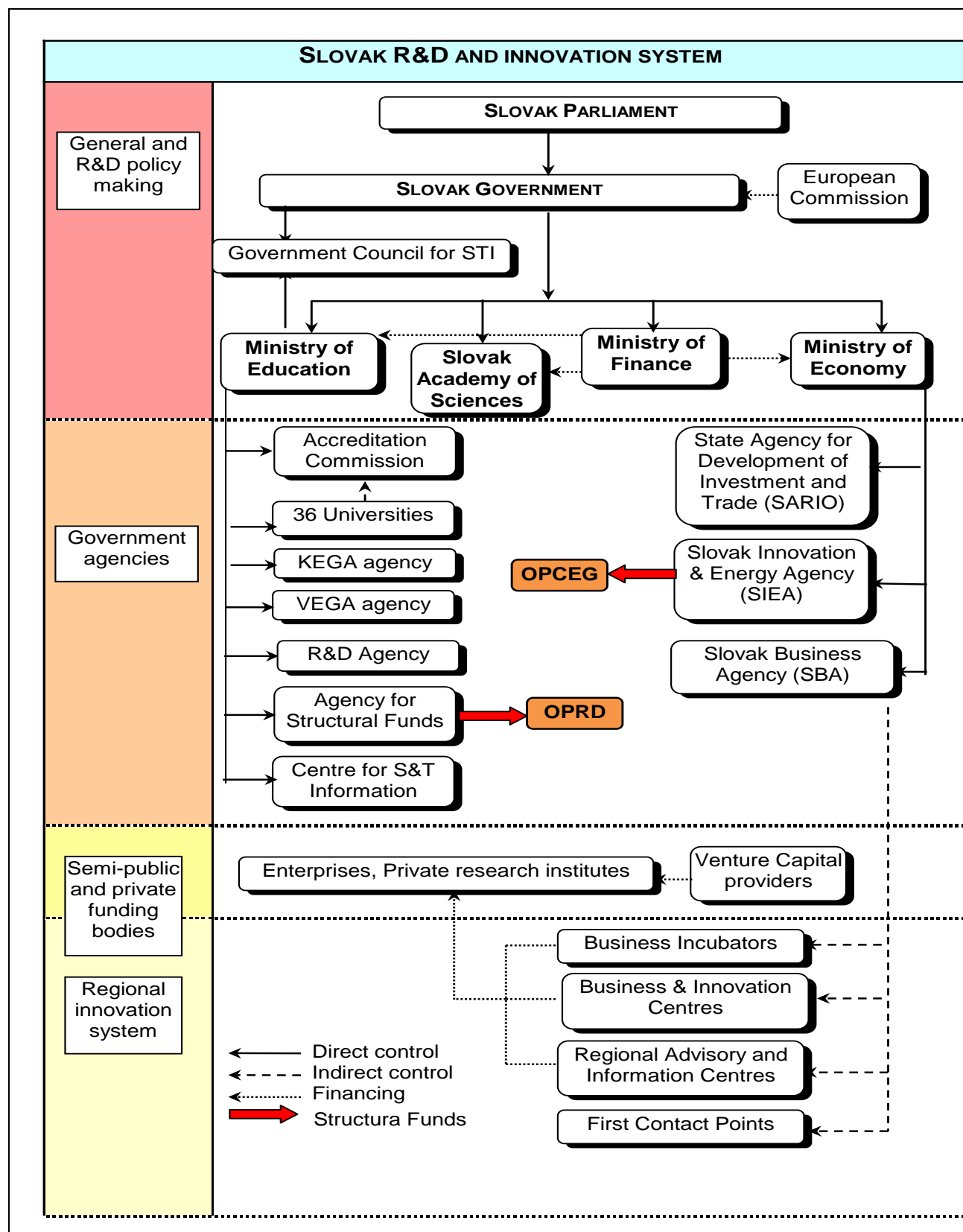
- The Smart Specialisation Strategy, the RIS3 document) and the Action Plan for the RIS3 document,
- The Operational Programme Research and Innovations for 2014-2020;
- The 2012-2013 Annual Reports on R&D;
- The 2012-2013 Annual Report of the Slovak Academy of Sciences;
- Proposal for Law on Public Research Institutions and amendments of the 185/2009 Law on the R&D Stimuli and the 172/2005 Law on Organisation of the State Support to R&D;
- Implementation of the 2007 Innovation Strategy;
- Proposal for the new programmes of the Research and Development Agency;
- Information on international co-operation on science and technology.

Since 2007, responsibilities for the research and innovation policies are separated between the **Ministry of Economy** (ME) and the MESRS. Innovation policy measures are implemented by the ME and its agencies. The ME drafted the 2007 Innovation Strategy and 2008 Innovation Policy and the 2011 Innovation Policy documents. It also established the Slovak Innovation and Energy Agency (SIEA) in 2007. This organisational division was prompted by introduction of the Structural Fund programmes. The ME implements the Operational Programme of Competitiveness and Economic Growth (OPCEG). The MESRS implements the Operational Programme Research and Development (OPRD) and the Operational Programme Education (OPE). As to manage the OPRD and OPE, the MESRS established the Agency of the MESRS for the Structural Funds of the European Union (ASFEU).

The **Slovak Academy of Sciences** (SAS) is a research body providing the bulk of basic research in Slovakia. In 2014 the SAS comprised of 56 research institutes (15 in nature science and engineering, 21 in life science

and chemistry, and 20 in social sciences and humanities) and 8 other units (service organisations and infrastructure facilities). The SAS is an autonomous body within the system of the central government and has its own chapter in the Slovak State Budget Law. The SAS ranks to most important beneficiaries of the SF/ESIF in Slovakia. European resource supported may Centres and Excellence, University Science Parks and Research Centres in the SAS.

Figure 1 Organogram – governance of R&D funds (including structural funds for R&D)



Bottlenecks in system of R&D governance

Current system of governance of research, development and innovations (R&D&I) is a major bottleneck for participation in FP7/Horizon 2020 and the absorption of ESIF. Slovakia has one of the poorest R&D&I systems in Europe, but has a surprisingly high number of public agencies (Figure 1).

Governance of the R&D&I is split between the Ministry of Education, Science, Research and Sports (MESRS) and the Ministry of Economy.

The MESRS manages as much as five research funders:

1. The Structural Fund Agency,
2. The Research and Development Agency;
3. The VEGA Agency for Universities;
4. The VEGA Agency for the Slovak Academy of Sciences;
5. The KEGA Agency for higher education institutions

The Ministry of Economy has three research and innovation funders:

1. The Slovak Innovation and Energy Agency SIEA;
2. The Slovak Business Agency SBA;
3. The Slovak Investment and Trade Development Agency SARIO.

The governance system is quite fragmented and there is no oversight of the system as a whole. Different Ministries have their own interests. The system generates duplications, lacks thematic focus, and has a rather high number of implementing agencies. Major problems of the system include:

- Slovak research policies used to be fairly generic and with no clear thematic focus. Basic documents on Slovak R&D policies¹ contained references to 12 research themes (including energy/climate change, health, ageing and sustainable development). This lack of thematic focus impacted adversely upon the quality of research, as it led to a diluting of resources, and a failure to develop critical mass in promising research themes².
- There is a substantial disparity between schemes funded from the Structural Funds (via OPE, OPRD and OPCEG) and those funded from national resources (RDA, VEGA, SBA). Agencies implementing Structural Funds tend to have budgets of an order of magnitude higher than those from the national resources. Schemes funded from the national resources, however, account for a notably higher flexibility and much lower administrative burden. The result is that there is very little synergy built between the Structural Fund schemes, which mostly support research infrastructure or applied research, whilst the RDA schemes support basic and applied research from national resources. The VEGA and KEGA (mini)grants are akin to competitive institutional finance, again from the national resources. Research projects are unable to combine funding from a range of national and European resources. There are many situations where a researcher obtains EU funding for infrastructure development from the ASFEU, but fails to obtain the necessary operational project finance from the RDA with national funds.
- The department-based system of R&D&I support creates barriers between the different phases of real innovation projects (the so called 'silo effect'). It also makes complex evaluation of research results problematic. Particular existing R&D&I support programmes have their own system of (complicated) rules. These rules differ substantially from each other. From the recipient point of view, they are experienced as separate schemes. The schemes have different targets, rules, control and monitoring and evaluation procedures. Fragmented system of support further discourages private investment in research and innovation.

¹ See the 2007 Long-term Objective of the State S&T Policy up to 2015, the 2008 Strategy implementing the 'Long-term Objective of the State S&T Policy up to 2015' in the period 2008-10 and the 2010 New Model of Financing Science and Technology in the Slovak Republic.

² There was a trend in losing thematic focus in 2006-2013. Three most important themes (industrial production, agriculture and defence) accounted for some 31.8% of the total GBAORD (by NABS 2007 socio-economic objectives) in 2006. By 2013 three most important themes (industrial production, healthcare and agriculture) accounted for some 16.2% of the total GBAORD. Outlays on general advancement of knowledge, on the other hand, increased from 39.7% to 69.0% of total GBAORD in the same period.

The Smart Specialisation Strategy envisages merging incumbent eight research and innovation agencies to two: agencies directed by the MESRS should merge to the Research Agency, while agencies directed by the Ministry of Economy to the Technology Agency. The Technology and the Research Agency should implement the Operational Programme Research and Innovation in planning period 2014-2020.

Bottlenecks and weaknesses assessed in the national S3 strategy

Analytical Chapters 2.5 and 2.7 of the S3 document acknowledge some long-standing problems with governance of research (barriers to commercialisation of research results, and support to mass education rather than excellent research).

The Slovak research system may be quite efficient in terms of input/ output ratios (value for money), but has **problem with efficacy**. Slovak research institutions, for example, are able to generate papers and citations with at a relatively low unit cost, but rarely appear in the leagues of top-class research performers³. The S3 document (Chapter 2.5) suggested 'concentration of critical mass of support to prospective research fields as to enter the World elite research'.

The chapter points to some problems with establishing excellence research and education. No Slovak HEI was included into the list of top 500 World's HEIs, in contrast to a number of several Czech and Hungarian universities. Slovakia also faced serious brain drain and ranked among countries with the highest emigration rates⁴.

The S3 document also contains an analysis of major R&D schemes and other policy measures targeting research, development and innovation (chapter 2.3.3). There were substantial **problems with implementation of the Structural Funds schemes, co-ordination between implementation agencies, fragmentation of support policies**, no regional R&D&I policies, and lack of thematic and sectoral priorities in the key Operational Programmes 'Research and Development' and 'Competitiveness and Economic Growth'.

The S3 document mentions some of the aforementioned issues ('dysfunctional national innovation system - a dysfunctional system of management, monitoring and evaluation of innovation', 'the low level of cooperation between academia and industry sector', 'fragmentation of the state budget sources and the Structural Funds to a large number of R&D infrastructure projects').

SWOT analysis of the R&I system

Major strengths and weaknesses of the governance of the R&I system, with particular focus on the governance of the ESIF are summarised in the SWOT analysis.

³ The 2014 SCIMAGO Institution Ranking by outputs ranks the Slovak Academy of Science no 493, the Comenius University no 770 and the Slovak University of Technology no 1043. Position of all three leading Slovak institutions continuously deteriorated in 2009-2013.

⁴ The Eurostat data indicate that some 17% of total ISCED 5-6 Slovak tertiary students studied in another EU country in 2012. Numbers of Slovak ISCED 5-6 students in the EU countries rose from 4.5 thousands in 2000 to 35.2 thousands in 2012. The Czech Republic was destination for some 70.4%, the UK 8.6%, Hungary 7.2% and Austria 4.9% of Slovak tertiary students in the EU28.

Table 1 SWOT Analysis of the Slovak R&I system

Strengths	Weaknesses
<ul style="list-style-type: none"> ➤ Awareness of link between poor R&D performance and R&D governance ➤ The S3 document identifies major challenges in area of R&D governance and sets course of major governance reforms ➤ Slovak Government is committed to reform of R&D governance. ➤ Course of governance reform set in the National Reform Programme and the Action Plan for the S3 document. 	<ul style="list-style-type: none"> ➤ Fragmented system of R&D&I governance. Low co-operation by key stakeholders. ➤ Comprehensive R&D&I strategy missing till 2014. ➤ Lack of thematic focus of the public R&D&I policies ➤ Low degree of mutual complementarity between OPs and complementarity of OPs with national support measures ➤ Fragmentation of support to large number of small-scale projects ➤ Low co-operation by industry and academia sectors ➤ Overlapping activities and misallocation of national and European resources ➤ Extremely low national support to R&D ➤ Soft criteria for accreditation of HEIs ➤ Block funding rules favour mass education and production of low-quality research outputs ➤ Missing complementarities between the FP7 and Structural Fund schemes ➤ Funding for excellent science competes with abundance of Structural Fund resources ➤ Serious problems with absorption capacity for the Structural Funds schemes ➤ Sustainability of large-scale infrastructure projects once the EU resources dry up.
Opportunities	Threats
<ul style="list-style-type: none"> ➤ Synergies created by complementarity of national and European resources (Operational Programme Research and Innovations) ➤ Synergies stemming from the ESIF and Horizon 2020 ➤ Slovak science becomes better integrated into the European networks of excellence ➤ Slovakia benefits from improved participation in the Horizon 2020 and other EU programmes ➤ Slovakia benefits from improved participation in the European Technology Platforms, Joint Undertakings and Technology Initiatives ➤ New set of evaluation criteria for HEIs and SAS may promote establishing truly excellent research institutions in Slovakia ➤ Excellent science may benefit from a better thematic focus 	<ul style="list-style-type: none"> ➤ Some R&D performers may prefer current model of block funding and oppose governance reforms ➤ Vested interests and strong lobbying for soft evaluation criteria may slow-down and/or divert governance reforms ➤ Government's commitment to governance reform may ebb ➤ Abundant funding from Structural Funds would continue killing interest in Horizon 2020 projects ➤ Low wages in research sector damp interest by talented young people in pursuing careers in excellent science ➤ Limited pool of scientific talent would made 'stairway to excellence' difficult ➤ Industry and academia sectors do not develop strong links of co-operation

3. FACTORS THAT SUPPORT OR LIMIT THE NATIONAL PARTICIPATION IN R&D CALLS FUNDED BY SF/ESIF

The Slovak Republic was unable to create complementarities between the national and European resources. The Slovak government pointed to the abundance of European resources as a justification for reducing dramatically national public funding for R&D⁵. Most HEIs and research institutions considered resources from the Operational Programme Research and Development (OPRD) easier to obtain and scaled back their efforts to apply for the FP6 and FP7 projects. The OPRD calls did not mirror national thematic priorities and were not related to national programmes implemented by the Research and Development Agency. Their high administrative burden favoured applicants with well-developed administrative capacities, and being able to satisfy the formal bureaucratic formal criteria was often more important than being able to demonstrating research results. High administrative burden and poor planning limited absorption capacity for &D calls funded by SF/ESIF.

The Operational Programme Research and Development accounted for some 10% of Structural Fund outlays in Slovakia 2007-13/15. The OPRD invests €1209.4m from the ERDF and €213.4m from the Slovak state budget.

Low absorption capacity in Slovakia

The Operational Programme Research and Development (OPRD) allocated €1422m to programmes supporting building / reconstructing research infrastructure, excellent science and knowledge transfer. Support by the OPRD actually was higher than the total national support to R&D from public resources in Slovakia in period 2008-2013 (€1273m). Underdeveloped and undernourished R&D system coped with serious problem of absorption capacity of the EU funds.

The OPRD originally envisaged allocating about half of total resources to knowledge transfers projects (Policy Measures 2.2 and 4.2, see Table 1). Undernourished public sector, however, had little to offer and underdeveloped business sector generated low demand on research outputs.

By 2011 the OPRD accounted for total certified spending rate 20.2%. Knowledge transfer policy measures had even lower spending rates (10.0% and 8.6%). It became clear that Slovakia was unable to spend the OPRD resources by 2013. The Slovak government intended speeding up construction of motorways and reallocating €400m among several operational programmes. It wanted to deduct €180m from the Operational Programmes 'Research and Development' and 'Education'. The European Commission opposed to the plan and suggested speeding up R&D spending instead. The government abolished its original plan and agreed to speed up the R&D spending via support to low number of large infrastructure projects. The OPRD was not the only operational programme with low absorption capacity in Slovakia. A serious threat emerged that Slovakia would have to return significant part of the Structural Funds back to the European Commission.

⁵ As for the thematic priorities, support from the OPRD has been quite fragmented. The MESRS did not indicate any thematic priorities. Some 67 Centres of Excellences, for example, could apply for support in almost 50 fields in science. Average support was €3.3m and there are concerns on sustainability by most CE once the project ends. Material science (26 projects), environment and quality of food (24 projects) and biomedicine and biotechnologies (23 projects) were most frequented themes in 102 projects approved for the Centres of Excellence. As for the Research and Development Centres, material science (23 projects), biomedicine and biotechnologies (21 projects), sustainable energy (19 projects) and industry research (16 projects) accounted for major part of support (out of total 101 projects). Eight competence centres asked support for biomedicine and biotechnologies (3 cases), information and communication technologies (2 cases), material sciences (2 cases) and industry research (one case). Research and non-research infrastructure in HEIs (OPRD 1.1 and 5.1) supported priorities in environment and food protection (11 projects) and biomedicine and biotechnologies (4 projects); As for the geographical breakdown of the CE, RDC and CC, the highest numbers concentrated in the Bratislava (70), Žilina (41) and Košice (62) NUTS III Regions. Geographical breakdown corresponds with ranking of the most successful institutions: the Slovak Academy of Science (155 participations), Slovak University of Technology in Bratislava (51 participations), Comenius University in Bratislava (36 participations), University of Žilina (30 participations) and University of Technology in Košice (22 participations). Businesses accounted for 149 and (semi-public) industry research institutions for 28 allocations.

The Slovak Government negotiated with the European Commission and was allowed to extend spending from Structural Funds till end of 2015.

Actions taken by national authorities to speed up the absorption

As to speed-up the OPRD spending, the Ministry of Education launched five calls for science and technology parks in the Bratislava Region (€224.74m) and five mirror calls in the non-Bratislava regions (€336.46m) from June 2012 to October 2013. The calls supported building seven University Science Parks and six Research Centres. All these projects must be completed by end of 2015.

All OPRD calls have been implemented by the Agency for the Structural Funds of the European Union (ASFEU) till 2012⁶. The last 5+5 calls from the OPRD (€561m) targeted science and technology parks and were launched directly by the MESRS in July 2012 - October 2013. In some years, OPRD calls allocated 20 times more money than the national support schemes (the RDA agency projects).

Low impact envisaged for funded projects

Switching from knowledge transfer to research infrastructure may help speed-up spending rates. There is a question of long-term sustainability of large infrastructure projects. The Operational Programme Research and Innovation (OPRI) is major source of research finance in period 2014-2020 in Slovakia. The OPRI Priority Axis 1 supports 'networks of excellence and competence centres of European significance' and promotes so-operation of Slovak research bodies with excellent European workplaces. The University Science Parks and Research Centres may be only as far successful as they are able to train sufficient number of excellent research staff and develop co-operation with European partners.

⁶ The ASFEU is fully owned by the Ministry of Education, Science, Research and Sports. The ASFEU also implements the Operational Programme Education (OPE). The OPE allocates €618.7m from the ESF and €109.0 from the Slovak state budget.

Table 2 Structural Fund schemes supporting research and development projects in Slovakia (Operational Programme Research and Development). Development of spending rates in 2011-2014

Policy measure	Total budget (State Budget + EU) 2007 (€m)	Certified expenditure / budget (%) Dec 2011	Certified expenditure / budget (%) Dec 2012	Certified expenditure / budget (%) Dec 2013	Certified expenditure / budget (%) Dec 2014	Contracted projects Dec 2014	Contracted projects (€m) Dec 2014
1.1 Reconstructing and building technical infrastructure of R&D	110.96	9.45%	14.63%	25.67%	61.82%	36	125.30
2.1 Support to networks of centres of excellence	155.48	30.94%	58.39%	81.77%	89.36%	67	157.65
2.2 Transfer of knowledge and technologies from R&D into practice	460.96	9.96%	16.11%	28.10%	45.37%	189	573.87
3.1 Reconstructing and building technical infrastructure of R&D in the Bratislava Region	25.49	27.24%	52.73%	74.77%	85.61%	2	25.86
4.1 Support to networks of centres of excellence in the Bratislava Region	74.34	38.60%	69.04%	79.84%	89.25%	40	93.84
4.2 Transfer of knowledge and technologies from R&D into practice in the Bratislava Region	271.89	8.58%	15.02%	26.47%	51.63%	81	208.00
5.1 Building and modernising HEI infrastructure	285.29	40.26%	56.27%	69.77%	79.82%	75	306.00
6.1 Technical assistance to Convergence objective	26.12	24.50%	32.78%	42.75%	55.21%	28	25.50
7.1 technical assistance to Regional Competitiveness and Employment	12.29	19.52%	27.03%	36.07%	46.12%	28	10.44
Total	1 422.84	20.18%	32.28%	45.70%	62.74%	535	1 606.48

Source: Central Co-ordination Office of the Slovak Government: National Strategic Reference Framework

Research infrastructures

The Smart Specialisation Strategy for Slovakia (S3 document) contains analytical chapters on R&D potential in the Slovak Republic. The process of building national research infrastructure is summarised in chapter 2.5.6 of the S3 document. The vast majority of the capacities to date have been built from the Structural Funds. By the mid-2000s, the Slovak Republic had an underdeveloped and ageing R&D infrastructure: the government intended modernising R&D infrastructure, but allocated inappropriately low financial means to the modernising programmes⁷. Those national resources proved inadequate for building a modern R&D infrastructure.

⁷ The State R&D Programme 'Complex Solution of Support and Efficient Use of Research and Development Infrastructure' was one of ten State R&D Programmes (SRDP) approved by the Slovak Government via the Government Resolution No. 232/2002 of 4 September 2002. The Programme reflected poor state of the R&D in early 2000s. It supported capital expenditure in three important projects: (i) Building Centre of Excellence for Biotechnologies 'BITCET' (€4.7m); (ii) Completing Top-notch Laboratory for Nuclear Magnetic Resonance 'NMR' (€6.5m); and (iii) Electromagnetic compatibility 'EMC' (€1.5m). The Research and Development Agency

The Slovak Government passed the National Strategic Reference Framework in 2006 and decided that the research and innovation infrastructure would be supported from three Operational Programmes ('Research and Development', 'Bratislava Region' and 'Competitiveness and Economic Growth'). All three programmes rely on the European Regional Development Fund (ERDF), but support different targets and do not allow for funding across the complete innovation cycle (from research to exploitation).

The issue of fragmentation of the support is neatly demonstrated by the fact that the Slovak Republic supported 67 Centres of Excellence with an average budget of €3.2m per project. There also were some 98 Research Centres supported with €101.1m (€1.0m per project). In contrast 33 Research and Development Centres with an average budget of €20m per project were supported in the Czech Republic.

Lesson learnt from the implementation of Structural funds between 2007-2013

Chapter 2.3.3 of the S3 document offers some reflection of difficulties related to the OPRD implementation and specifies recommendations for future actions in R&D infrastructure building. The Operational Programme Research and Development has been a mixed blessing for the Slovak research. It provided a spectacular amount of money to a heavily underfunded system. Implementation of the OPRD, however, was rather problematic. The OPRD

1. lacked a good-quality implementation strategy (administrative problems and inefficient governance delayed first calls from the OPRD by one year; the OPRD faced a serious time squeeze and Slovak Government considered reallocating a considerable part of the OPRD means to other operational programmes; there was no complementarity between the OPRD and FP7 projects);
2. was inadequately linked to innovations and accounted for low levels of co-ordination between key stakeholders in innovation development (e.g. science parks are the responsibility of the Ministry of Education and business incubators in the competence of the Ministry of Economy; public sector received 82.6% of total support and business sector participants coped with difficulties in industry-academia projects));
3. created an extremely high administrative burden⁸;
4. lacked clear thematic priorities and did not reflect either the production or export specialisation of Slovakia;
5. support was fragmented large number of small-scale projects (many Centres of Excellence are unlikely to prove sustainable when OPRD support ends);
6. displaced FP6 and FP7 funding (the OPRD projects imposed a high administrative burden but were much easier to get than the FP7 projects);
7. crowded-out national R&D funding.

The positive impacts of the OPRD projects included:

1. Some calls were able integrate applicants from business and academia sectors;
2. Five national projects supporting large-scale scientific infrastructure of R&D in Slovakia;
3. An effective concentration of most research infrastructure in three regions: Bratislava, Žilina and Košice.

There are a number of clear lessons which can be learned from the experience, in particular from the negative outcomes from the way the programme was administered. The negative outcomes from the process included:

- A highly distortive effect from high levels of project funding compared to national public resources;
- Poor design in terms of clear vision, targets and policy measures;

launched the Centre of Excellence Programme in science and engineering in 2007. The programme supported investments to R&D infrastructure up to 70% of total costs. The overall budget of the programme, however, was low. Seven Centres of Excellence received total support €4.3m, of which capital expenditure €1.3m.

⁸ If a computer was purchased from the Structural Fund means owners of the computer were asked to use it solely for the purposes of a specific project. If the computer was used for Skype calls, audit authorities sometimes demanded transcripts of the calls.

- Low degree of mutual complementarity between OPs and complementarity with national support measures;
- No clear thematic and/or sectoral priorities;
- Flat support to incumbent institutions and no focus on excellent research (67 Centres of Excellence in a small country effectively mean no excellence at all);
- Fragmentation of support to large number of small-scale projects (it was as late as 2012 that the first large-scale projects on science parks were launched);
- Overlapping activities and misallocation of resources;
- An extremely high level of administrative burden, which reduced the potential that recipients had to find other funding and therefore development sustainability for the capacity then being built up;
- Problems with absorption capacity and sustainability of projects once support from the EU resources ends.

4. PUSH – PULL FACTORS FOR R&I PERFORMERS TO PARTICIPATE IN FP7/H2020

Slovakia's performance in the FP7

Numbers of FP7 project applications was much lower in Slovakia than in countries with comparable population and per capita GDP profiles. As for the average sum applied for (per researcher), Slovakia occupied 27th place out of 27 Member States. Even accounting for the relative scientific and innovation underdevelopment of the Slovakian economy, Slovakia underperforms in terms of both FP7 projects applications and funding received⁹.

This relatively poor performance was influenced by a range of multiple factors, including :

- the quality of research proposals submitted,
- the relative position of Slovak researchers within in project consortium (co-ordinator versus participant),
- the wage levels in recipient countries. Slovak researchers account for wages several times lower than their colleagues in advanced EU Member Countries moreover, Slovakia appears to be one of the worst performers out of the group of low wage countries.
- Slovak research organisations and Universities also accounted for less developed research infrastructures and were less likely to become project co-ordinators. There were 39 Slovak co-ordinators, but 445 partners in the FP7 in total.

Slovak applicants mostly were successful in projects with below average funding (i.e. small projects).

Regional breakdown

Regional breakdown of success rates in the FP7 projects follows the regional distribution of research capacities in Slovakia, which are dominated by the capital region. The Bratislava Region accounted for some 52% of total Slovak GERD (2013), 56% of total applications, 60% of total project participations and 63% of the total FP7 funding obtained in 2007-2013.

Category of participants

HEIs and public research institutions (PROs) were the most frequent Slovak participants in FP7 activities, followed by private companies. Private firms however, account for the highest share acquired in total funding (34.8%), followed by the HEIs (33.8%) and public researcher organisations (25.9%).

Wages

Wages in Slovak HEIs and PROs are set by state regulations and generally low, whilst in private firms wages tend to be higher. Higher wage flexibility in private sector is an important factor behind higher success rates by the Slovak private bodies than those by public bodies in FP7.

SF Regulation influencing Firms participation in FP

Regulations on Structural Fund resources also contributed to higher participation rates of private firms in the FP7. In the 2007-2013/2015 programming period private firms had limited access to R&D projects under the calls by the Operational Programme Research and Development. Therefore the only source of European funding available for their activities was through FP7, which may explain their increased level of activity.

The message that emerges from statistics on the FP is that Slovakia is clearly underperforming in terms of FP7 projects. Data from the ECORDA database indicate that Slovakia won 480 project participations and obtained only €77.77m (as of September 2014). Average success rate was 17.9% for Slovak participants (EU28: 20.9%). The Slovak Academy of Sciences (€17.18m), Slovak University of Technology in Kosice (€4.23m), and Comenius University in Bratislava (€4.01m) were the most successful Slovak Participants in FP7 (Table 2).

The Cooperation programme was the largest part of FP7. Researcher teams from Slovakia have participated in 235 projects and received EU contribution €49.63m. The highest level of participation was recorded in ICT thematic area (62 projects, €11.41m), nanotechnologies, nanomaterial and new materials (35 participations, €8.59m) and security projects (19 participations, €7.13m). By June 2014 some 480 teams from Slovak

⁹ Source: European Commission (2015): Stairway to Excellence. Cohesion Policy and the Synergies with the Research and Innovation Funds Slovakia (SK). Facts & Figures, Joint Research Centre, Seville.

Republic have participated in 383 projects. Teams from Slovakia have participated in 1.5 % of all projects; however, the EU contribution contracted by Slovak participants accounted for 0.17 % of the amount which has been allocated in FP7 calls for proposals. The EU contribution per researcher in Slovakia is one of the lowest in the EU28 (€5,554 per capita). Most of the participants were based in the (NUTS III) Bratislava Region (282 teams), followed by the Košice Region (59 teams) and Žilina Region (35). The Bratislava Region obtained €45.92m, some 60% of total EU contribution to Slovak participants in the FP7.

Most teams were recruited from private commercial companies (150), higher education sector (146), and research institutions and centres (122) ¹⁰.

Table 3 : The most successful Slovak participants in the FP7

Organisation name	Organisation type	No of participations	EU contribution (€m)
Slovak Academy of Sciences (all institutions)	GOV	90	17.18
University of Technology in Kosice	HEI	18	4.23
Comenius University in Bratislava	HEI	25	4.01
Ardaco, Plc	Business	7	3.94
University of Zilina	HEI	23	3.78
Pavol Jozef Safarik University in Kosice	HEI	8	3.51
Slovak University of Technology in Bratislava	HEI	30	3.32
Slovak University of Health in Bratislava	HEI	11	2.31
GA Drilling, Plc	Business	2	1.35

Source: SOVVA, Slovak Organisation for Science and Research Activities 2014. Data from the: E-corda, as of 26.06.2014.

Slovakia participation in other FP7 related initiatives

Looking across other important ERA initiatives, Slovakian performance has mirrored that of Framework Programmes by being well below that which might be expected looking at other comparable countries. No policy document on the European Innovation Partnerships (EIPs) was in force by 2013 in Slovakia. Membership in the EIP happened on the ad hoc basis. Information on Slovakia's activities in the EIPs is scarce. The Slovak Republic is a member in the EIPs on 'Active and Healthy Ageing', 'Agricultural Productivity and Sustainability', 'Water' and 'Raw Materials'. Most Slovak activities concentrate in the 'Active and Healthy Ageing' partnership. Slovakia, for example, participates in the 'Visually Impaired Seniors Active Learning' initiative, 'Patient Medication Adherence' programmes and the 'Knowing Effects on Healthy Life Years' project.

Major push – pull factors for R&I performers to participate in FP7/H2020

Major push – pull factors for R&I performers to participate in FP7/H2020 by Slovak research bodies include:

1. Underdeveloped and undernourished national system of research and development, and low levels of excellence of the research base;
2. Principles for block and competitive funding for public research bodies, which favour mass education and discourage excellent research;
3. Competition of the FP//Horizon 2020 funding with the Structural Fund resources.

Underdeveloped and undernourished national system of research and development

Slovak research system is heavily underfunded. Slovak gross expenditure on research and development (GERD) was €610.9m (0.83% of GDP) in 2013. Total Slovak GERD and BERD as per cent of GDP were respectively about 2.5 times and 3.5 times lower than those in the EU28 in 2013 (source: Eurostat 2015: Gross expenditure on research and development).

Public research organisations (PROs) and higher education institutions (HEIs) provided 41.6%, businesses and private non-profit organisations (PNP) 40.4% and foreign funders 18.0% of total GERD in 2013 in Slovakia.

Three major flows dominated the Slovak research system:

- (i) government to government sector (13.4%),
- (ii) government to higher education sector (23.1%) and

¹⁰ Source SOVVA (Slovak Organisation for Research and Development Activities): *Slovak FP7 Success Stories Under One Cover*. Data from the: E-corda, as of 26.06.2014.

(iii) Business to business sector (37.6%).

The flows from business to government, and business to higher education sector accounted for 1.7% and 0.9% total funding flows in 2013. Structure of flows points to the poor interconnection of the public and private sector. Increasing reliance of Slovak research system on the EU funding was another important trend in 2000s. The EU funding was major factor behind increase in share of GERD in GDP from 0.46% in 2007 to 0.83% in 2013 (source: Eurostat).

Poor funding was reflected in sub/optimal performance of public and private research bodies. Top Slovak public research performers (Slovak Academy of Sciences, Comenius University in Bratislava and Slovak University of Technology) significantly lagged behind their counterparts in the Czech Republic and Hungary. As for the 2014 SCIMAGO institutional ranking indicators, Slovak research bodies achieved ranks several hundred places lower than the Czech and Hungarian Academies of Sciences and top Universities (**Table 4**).

There was a clear link between excellence in research and ability to tap the FP7 funding. Rates of success by the Slovak public research bodies in FP7 copied those by SCIMAGO rankings. The Slovak Academy of Sciences, Comenius University in Bratislava and University of Technology in Kosice were most successful Slovak public bodies in the FP7 in terms of participations and EU contribution.

Table 4 : The SCIMAGO indicators for top 3 research institutions in Slovak, Czech Republic and Hungary (2014)

Slovakia	Czech Republic	Hungary
Output		
(493) Slovak Academy of Sciences (770) Comenius University in Bratislava (1043) Slovak University of Technology	(114) Academy of Sciences of the Czech Republic (160) Charles University (606) Czech Technical University in Prague	(282) Hungarian Academy of Sciences (667) Budapest University of Technology and Economics (749) Semmelweis University
Scientific Talent Pool		
(737) Slovak Academy of Sciences (756) Comenius University in Bratislava (1082) Slovak University of Technology	(171) Charles University (232) Academy of Sciences of the Czech Republic (674) Masaryk University	(439) Hungarian Academy of Sciences (677) Semmelweis University (827) University of Szeged
Excellence		
(1414) Comenius University in Bratislava (1530) Slovak Academy of Sciences (1613) Slovak Medical University in Bratislava	(638) Institute of Experimental Botany of the ASCR (CASCZ) (816) Institute of Botany of the ASCR (CASCZ) (876) Institute of Biophysics of the ASCR (CASCZ)	(215) Research Institute for Particle and Nuclear Physics Hungarian Academy of Sciences (HAS) (883) Biological Research Center Hungarian Academy of Sciences (HAS) (887) Institute of Nuclear Research Hungarian Academy of Sciences (HAS)
International Collaboration		
(483) Slovak Academy of Sciences (594) Pavol Jozef Safarik University in Kosice (690) Comenius University in Bratislava	(141) Institute of Physics of the ASCR (CASCZ) (202) Nuclear Physics Institute of the ASCR (CASCZ) (209) Astronomical Institute of the ASCR (CASCZ)	(78) Research Institute for Particle and Nuclear Physics Hungarian Academy of Sciences (HAS) (79) Institute of Nuclear Research Hungarian Academy of Sciences (HAS) (142) Research Institute for Solid State Physics and Optics Hungarian Academy of Sciences (HAS)
Q1 - High Quality Publications		
(2849) Slovak Academy of Sciences (3000) Comenius University in Bratislava (3494) Pavol Jozef Safarik University in Kosice	(535) Institute of Organic Chemistry and Biochemistry of the ASCR (CASCZ) (733) Institute of Botany of the ASCR (CASCZ) (808) Institute of Experimental Botany of the ASCR (CASCZ)	(422) Biological Research Center Hungarian Academy of Sciences (HAS) (944) Research Institute for Solid State Physics and Optics Hungarian Academy of Sciences (HAS) (1438) Chemical Research Center Hungarian Academy of Sciences (HAS)

Source: The 2014 SCIMAGO Institution Ranking. Notes: **Output**: Total number of documents published in scholarly journals indexed in Scopus. This is a size-dependent indicator. **Scientific talent pool**: Total number of authors from an institution in the total publication output of that institution during a particular period of time. This indicator is size-dependent. **Excellence Rate**: Excellence rate indicates the amount (in %) of an institution's scientific output that is included into the set of the 10% of the most cited papers in their respective scientific fields. It is a measure of high quality output of research institution. This is a size-independent indicator. **International Collaboration**: Institution's output ratio produced in collaboration with foreign institutions. The values are computed by analyzing an institution's output whose affiliations include more than one country address. **Q1 - High Quality Publications**: Ratio of publications that an

institution publishes in the most influential scholarly journals of the world, those ranked in the first quartile (25%) in their categories as ordered by SCIMAGO Journal Rank (SJRII) indicator.

Bottlenecks in block and competitive funding for public research bodies

Institutional funding accounted for over 21% of total support to research and development in Slovakia in 2012 (Source Eurostat). The Slovak Republic uses two types of institutional funding: (1) block funding and (2) competitive institutional funding. Block funding mostly reflected staff entitlements and generated relatively low incentives for excellent research.

Block funding is provided to the Slovak Academy of Sciences (SAS) and public higher education institutions (HEIs). The SAS has a single block grant determined by the State Budget Law. The total block grant for the public HEIs is also determined by the State Budget Law, but grants for particular HEIs are distributed via the Slovak Ministry of Education, Science, Research and Sports (MESRS).

Block and competitive funding for HEIs

Annual block funding (2015: €449.13m) includes four major components (Table 4):

- (a) support to accredited study programmes (teaching, €243.90m);
- (b) support to R&D and art activities (€147.26m);
- (c) support to development of HEI (€1.50m);
- (d) support to students from low-income families (€54.85m).

Components (a) and (b) are of prime interest by HEIs. Support to development of HEI (component 'c') is low and considered case by case. Component 'd' directly is given to students.

Table 5: Support to higher education institutions, €m

Year	2015	2014	2013	2012	2011
Total, of which	449.13	442.30	443.42	441.42	424.98
(a) accredited study programmes	243.90	242.05	233.34	232.87	261.45
(b) R&D and art activities	147.26	143.11	144.63	144.63	106.05
(c) HEI development	1.50	2.29	5.99	6.00	4.84
(d) social support to students	54.85	54.85	59.46	57.94	52.65

Source: Slovak Ministry of Education, Science, Research and Sports

The MESRS uses complex formulas for allocating institutional support (components 'a' and 'b') to 23 public HEIs¹¹. Different formulas were applied to accredited study programmes, and R&D and art activities in 2015 (Table 5).

- *Support to accredited study programmes:* Wages (€179.80m) generate bulk of support to accredited study programmes (€243.90m). The 2015 formula for wages in HEIs gives 85% weight to the number of students and a 15% weight to research/arts¹² output by particular HEIs.
- *Support to R&D and art activities:* Wages (€118.53m) generate bulk of support to HEIs' R&D and art activities (€147.26m). The 2015 formula for wages in 'R&D and art activities' gives a 43% weight to R&D quality of a HEI (as established by last accreditation), a 22.5% weight to the share of a HEI in the national research/arts output, a 10% weight to the share of a HEI in the national number of PhD students, a 13% weight to the share of a HEI in domestic grants, a 9% weight to the share of a HEI in foreign grants and 2.5% is determined by HEIs share in total domestic art output. Bulk of support to R&D and art activities (€129.70m) is in fact teacher's salaries.

¹¹ For the 28-page manual for HEIs finance see: MESRS (2015): [*Metodika rozpisu dotácií zo štátneho rozpočtu na rok 2014 pre verejné vysoké školy*](#) {Methodology for the state budget grants for public higher education institutions in 2014}.

¹² Arts outputs are considered for the HEIs specialized in music, drama and arts.

Three items: (1) Numbers of students; (2) R&D quality of a HEI (as established by last accreditation) and (3) publications generated 83% of the HEIs income in components (a) and (b) in 2014. Structure of income sources encouraged mass education and low-quality research:

- 1) Numbers of tertiary students soared after 1989 in Slovakia (Figure 2). Since 2009 demographic trends have pushed numbers of tertiary students down, but high numbers of students remained key source of the HEIs' income.
- 2) The main evaluation body for Universities is the Accreditation Commission of the Slovak Ministry of Education, Science, Research and Sports. It evaluated 27 higher education institutions (HEIs) in 2009-2010. The Accreditation Commission classified HEIs in three categories: (i) Universities, (ii) Higher Education Institutions and (iii) Professional Higher Education Institutions. Some 11 HEIs (out of total 35) were awarded the highest ('University') status. Quality of research by most HEIs, however is medium-low, at best. The [Webometrics Ranking of World Universities](#) contained only two Slovak Universities in list of top 1000 World Universities by January 2015 (the Comenius University in Bratislava no. 599, the Slovak University of Technology no. 746, and the Technical University of Košice no 1048)¹³.
- 3) The Ministry of Education, Science, Research and Sports ranks publications to four categories: A1 (research monographs and chapters in monographs), A2 (textbooks), B (papers in SCI and SSCI journals) and C (any other publications). The abovementioned categories were assigned weights 2/9; 1/3; 2/9 and 2/9 respectively. Low quality publications in the C category therefore had the same weight as the papers in high-quality journals. As for the A1 and A2 publications, criteria were rather vague¹⁴. A HEI therefore made little profit from a paper in good international journal. A better strategy was to concentrate on high numbers of low-quality publications¹⁵.

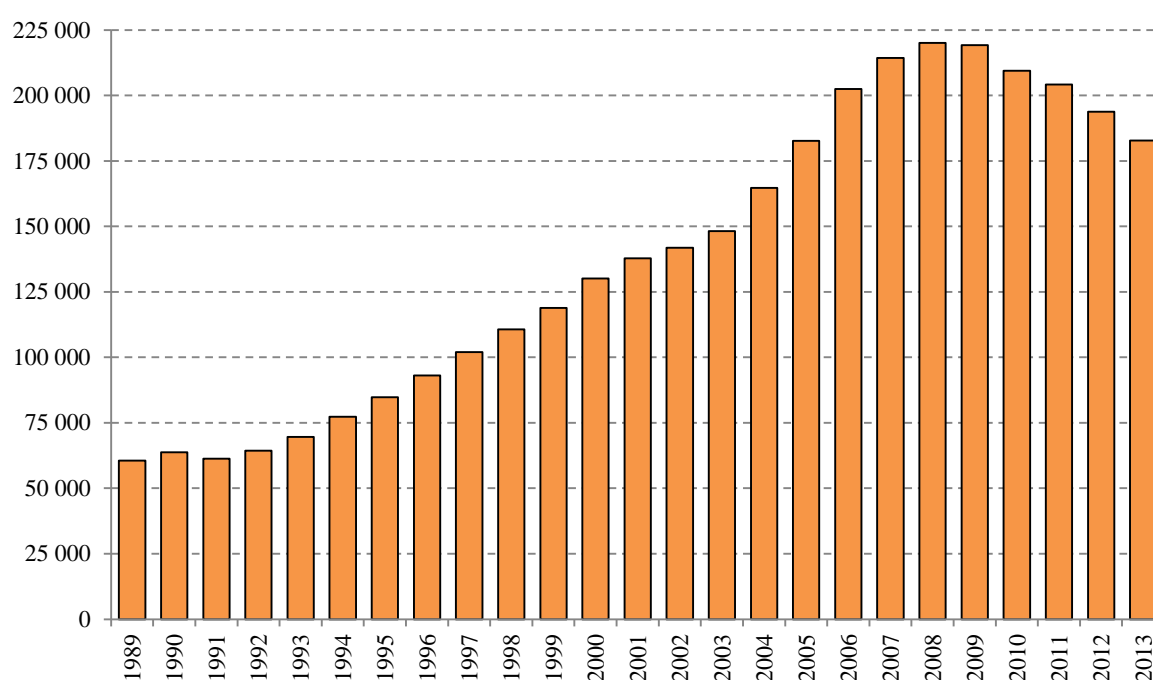
Ability of a HEI to win foreign and/or domestic grant, on the other hand, accounted for low weights in total support to R&D and arts. Shares of these items in total budget for R&D and arts activities were 14% and 14% respectively in 2011, but dropped to 12% and 10% by 2014 (Table 5).

¹³ The new round of the accreditations started in 2014. The Accreditation Commission approved new, more stringent rules on 15 April 2013. The rules put more emphasis on research excellence in terms of scientific papers published/cited in journals listed in the international scientific databases (WOS, SCOPUS), research monographs published with high-quality publishers and international patents.

¹⁴ Any publications with 60+ pages published by the HEI and reviewed by any two peers is considered 'research monograph'.

¹⁵ The 2013 Annual Report on the Higher Education mentions 2,132 of the A1 publications outputs, 3,133 A2 outputs, 2,370 B outputs and amazing 38,674 C outputs.

Figure 2: Numbers of tertiary students in Slovakia.



Source: Ministry of Education, Science, Research and Sports (2014)

Table 6 : Weights for distribution of block grants for higher education institutions

	2015	2014	2013	2012	2011
<i>Support to accredited study programmes, wage weights:</i>					
student numbers	0.850	0.850	0.850	0.850	0.850
share in publications	0.150	0.150	0.150	0.150	0.150
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
<i>R&D and art activities, wage weights</i>					
quality of HEIs by last accreditation	0.430	0.430	0.450	0.450	0.450
share of HEI in foreign grants	0.090	0.100	0.100	0.100	0.140
share of HEI in domestic grants	0.130	0.120	0.100	0.100	0.140
share of HEI in doctoral students	0.100	0.100	0.100	0.100	0.000
share of HEI in publications	0.225	0.225	0.225	0.225	0.245
share of HEI in art output	0.025	0.025	0.025	0.025	0.025
<i>Total</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>

Source: Slovak Ministry of Education, Science, Research and Sports

Competitive institutional funding from national resources is provided via the Vedecká grantová agentúra (VEGA) and Kultúrna a edukačná grantová agentúra (KEGA) grants. The VEGA and KEGA grants help to pay for the overhead costs of research institutions. The HEIs part of the VEGA provided €9.26m and the KEGA grants €2.46m in 2013. Research grants by the Research and Development Agency (RDA) generated income €12.47m. Total domestic grants (VEGA, KEGA, RDA) accounted for some 5.5% of total national public support to higher education in 2013 Slovakia.

The ECORDA database indicates that Slovak participants obtained €77.7m from the FP7 projects in period 2007-2014 (Table 7). Slovak higher education institutions (HEIs) accounted for substandard performance in the FP7. They accounted for 65.4% of total researchers in full-time equivalent, but obtained only 36.4% of the total funding received by the country €28.3m in the FP7 (€4.04m/year).

Effort put to excellent research did not pay for most Slovak HEIs. Institutional funding provided substantially higher source of income than the FP7 projects for the Slovak HEIs. Criteria for institutional funding (high numbers of students, easy-to-pass accreditation and influx of low-quality publications) also were much easier to pass than criteria related to research excellence in the FP7 projects.

Table 7: FP7 funding by type of beneficiary in Slovakia

	Funding M€	projects	co-ordinators
Higher education institutions	28.31	166	12
Other	1.29	20	8
Private companies	25.98	150	7
Public body	4.13	40	1
Public research organisations	18.06	104	10
Total	77.77	480	38

Source: European Commission, ECORDA Database

Block and competitive funding for the Slovak Academy of Sciences

The Slovak Academy of Sciences had total budget of €85.57m in 2013, of which €60.08m was block grant and the rest came from other resources (mostly Structural Funds)¹⁶. Most important sources of competitive included:

- The SAS participated in 61 FP6 and FP7 projects, and obtained €1.65m in 2013. The SAS also participated in 162 multilateral projects (COST, EUREKA, ERANET, UNESCO, NATO, CERN, ESPRIT, etc.) and obtained €0.78m in the same year.
- 595 domestic VEGA grants generated income €4.41m, and 191 domestic RDA grants €8.22m.
- 59 Structural Fund grants generated income €18.22m.

The FP6 and FP7 projects generated about 2% of the total income of the SAS in 2013. National block grant and infrastructure grants from the Structural Funds (Operational Programme Research and Development) accounted for vast majority of the SAS income in the same year.

Institutes of the Slovak Academy of Sciences have been evaluated every four years by their own accreditation commission from 1992 onwards. The latest round finished in 2012 and found an overall improvement in institute performance. The number A-grade institutes increased from 4 to 13 in period 2008-2012. Numbers of B-grade institutes decreased from 14 to 7 and C-grade from 2 to 0 in the same period. There is limited link between evaluation results and support to particular institutes of the SAS. The overall 2013-2015 wage budgets for the SAS were fixed, and had to reflect worker entitlements related to qualification and length of service. The SAS was allowed to re-distribute only 5% of total wage budget based on the evaluation results. Participation in the FP7 projects made little difference for the SAS workers in terms of salaries.

Competition of the FP/Horizon 2020 funding with the Structural Fund resources.

The Slovak Government indeed has been aware of the need to exploit cohesion support to develop the capacity of the R&I system to compete for funding in an excellence-based environment. Annex 2 of the S3 document pointed inadequate support of the national contact points. The awareness, however, has not

¹⁶ Source: Slovak Academy of Sciences (2014): The 2013 Annual Report.

transferred to specific actions. The relative abundance of cohesion funds, has a negative effect on demand for excellence-based funding¹⁷.

Annex 2 of the S3 document provides clear evidence that FP7 participation (both in terms of applications but also completions) was affected by the comparative accessibility and volume of the Structural Funds resources. Slovak applicants for FP7 projects were most active in 2007 (633 applications), before it was clear how the individual thematic programmes for R&D support under the Operational Programme Research and Development (OPRD) would operate.

Following the launch of these to calls related to the OPRD, there was a corresponding drop in the overall application levels to 200-300 applications per annum in 2008-2012 in the FP7. Similar to many of the EU13 countries, Slovakia did not manage to maintain its funding share from FP6 in FP7¹⁸.

The OPRD was launched by the Slovak Research and Development Agency in 2008. Competitive funding was relatively easy to obtain, but accounted for extremely high levels of paperwork, giving certainty but reducing the capacity of those skilled in bidding to simultaneously bid for Structural Funds.

The net effect was predictable: many research institutions and HEIs concentrated on the OPRD projects and therefore skipped FP7 applications, thereby failing to develop the expertise necessary to participate effectively in European framework programmes. There was a reverse selection problem that people went with lower-quality projects for the easier money rather than developing ambitious projects that would get the really stringent FP7 funding.

¹⁷ This section is based on the analytical part of the RIS3 document, and interviews performed by the author with managing authorities of the relevant operational programmes and the H2020 National Contact Points.

¹⁸ Source: European Commission, JRC-IPTS (2015), Stairway to Excellence Facts and Figure: Slovak Republic

5. POLICY INSTRUMENTS FACILITATING THE PARTICIPATION IN (FP7)H2020/(SF)ESIF

The Slovak Republic created some support structures for participation in the FP7 projects. These structures, unfortunately, received meagre funding. The support structures for FP7 also were unable to overcome some generic problems with research excellence in Slovakia.

Support structures for the FP7 programme (2007-2013 programming period)

The research and development agency (RDA)

Support to the activities in the European Research Area (Framework Programmes, COST, EUREKA, Eurostars, etc.) has been channelled via the Research and Development Agency in Slovakia. The programmes supported participation of the Slovak researchers in the Framework Programmes:

i. Programme for Supporting Project Preparation in the 7th Framework Programme (PSPFP7)

The Research and Development Agency (RDA) was running the Programme for Supporting Project Preparation in the 7th Framework Programme (PSPFP7) in period 2007-2010. The main goal of the PP7RP programme was to support active participation of Slovak top researchers, especially co-ordinators of projects in the FP7. The support programme focused its activity on large Scale Integrating Projects, Network of Excellence, Small or Medium-Scale Focused Research Projects, Initial Training of Researchers, Research for SME and Research for Association.¹⁹

General call for submitting applications for reimbursement of the costs related to the preparation of the project in FP7 was published once in the year. Total financial contribution given to each applicant was approved by the programme board and took into account results of the evaluation in European Commission – the Evaluation Summary Report and the justifiability of the application. Projects not recommended for funding may have also received financial contribution, but the support was limited by the above mentioned conditions.

Suggestion for improvement

Financial contribution could have been provided also for projects submitted in the past by the same or different applicant, and which had similar orientation, but in the reduced amount. The scheme unfortunately was terminated in 2010. Last projects received support in 2011. The scheme had very low budget. The programme supported 152 projects with €0.46m in period 2008-2011 (Table 6). Average support per project varied from two to three thousands euros in 2008-2011.

ii. Programme for Co-financing the 7th Framework Programme' (CF7RP)

The RDA also has been running programme on 'Co-financing the 7th Framework Programme' (CF7RP). The programme launched three open calls in 2008, 2011 and 2012. It supported participation of the top Slovak scientists and research teams in two types of the 7RP activities: Collaborative Projects and Networks of Excellence.

The applicants had to show grant agreement or accession to the grant agreement documents, project budget and list of bank transfers from the European Commission. The 2008 and 2011 calls had limited budget and provided applicants with quite modest support.

The 2012 call enabled for reimbursement of up to 25% total costs by Slovak participants. The programme in total supported 184 projects with €4.07m in period 2008-2013 (Table 8). Average support to project varied from four to twenty thousand euros in the abovementioned period.

¹⁹ Sources: The Research and Development Agency (2007-2013): Annual Reports.

Table 8: Programmes for financial support for the proposal drafting and project costs

Year	CF7RP		PSPFP7	
	projects	support (€m)	projects	support (€m)
2013	44	0.996	x	X
2012	49	0.978	x	X
2011	34	0.719	24	0.081
2010	35	0.807	41	0.121
2009	18	0.389	28	0.053
2008	4	0.184	43	0.166
2007	x	x	16	0.039

Sources: The 2007-2013 Annual Reports of the Research and Development Agency

Slovakia has been able to win just one ERC grant. In order to achieve any kind of improvement in European Research Funding performance, the Slovak Republic will need to match its national research priorities and cohesion funding with the Horizon 2020 priority areas. Policy instruments should be divided into several areas: (a) Excellent research; (b) industry research, and (c) grand societal challenges.

iii. The assessment of the national audit office to the FP7 support initiatives

The National Audit Office (NAO 2013) assessed efficiency of the FP7 resources in 19 faculties of selected higher education institutions in 2013. The audit also found that

- 'the Ministry of Education, Science Research and Sports (MESRS) did not analyse contribution of national and EU resources to priorities of R&D policies in Slovakia. There was no model for assessing efficiency of financial support to science, research and innovation'
- 'missing systemic support to project teams – from preparatory phases, via legal and financial support to IPR activities to marketing and popularisation of science'.
- lack of systemic tools for stabilising high-quality research staff and preventing brain-drain'.
- the Bratislava Region concentrated 34% of HEIs in Slovakia, but was excluded from most support under the Structural Fund schemes, The MESRS did not take Bratislava's disadvantage into account when implementing national policies supporting R&D.

Support structures for the 2014-2020 programming period

The H2020 national contact point system

The Slovak Republic established system of support structures to Horizon 2020 (including EURATOM). The support structures include 21 National Contact Points (NCP), 14 +2 National Delegates (ND) for the Horizon 2020 (+ EURATOM), and National Co-ordinator. The national delegates represent Slovakia in programme committees of the Horizon 2020.

The Ministry of Education, Science, Research and Sports (MESRS) is the national co-ordinator of the Horizon 2020 in Slovakia. The MESRS opened new office of the NCP in January 2014. The office provides information, legal and brokerage services for Slovak researchers wishing to find and/or co-operate with an European research partner. The office and NCP are housed in the Slovak Centre for Scientific and Technological Information of the Slovak Republic (SCSTI), an agency of the MESRS. The office transmits information on all important events related to the Horizon 2020. It organises a number of seminars and courses related to participation in programme activities.

Brussels liaison office

The Slovak Liaison Office for Research and Development was opened in July 2014 in Brussels. The office promotes a more active co-operation by Slovak research bodies in the Horizon 2020 Programme.

The Agency for the Structural Funds of the European Union (ASFEU)

The SF calls are managed by the Agency for the Structural Funds of the European Union (ASFEU). The ASFEU is agency of the MESRS. For the SF calls see chapter on factors that support or limit the national participation in R&D calls funded by SF. For policy instruments facilitating the participation in H2020 in 2014-2020 see chapter on enhancing and limiting synergies.

6. EVALUATION AND MONITORING MECHANISMS

The peer review process

Evaluation process for national funding

All national public competitive funding is subject to peer review in Slovakia, although it is currently fragmented across a number of agencies. These agencies, VEGA, KEGA and Research and Development Agency (RDA) all use a peer review process, including at least one foreign-based researcher, even where the grants are for few thousands euros.

Evaluation process for SF/ESIF funding

Conversely, Structural Fund projects invested billions of euros, but were evaluated by domestic evaluators only, and often more with an eye to allocating their budgets than to the requirements of international scientific excellence in planning period 2007-2013/15. The peer review system for the Structural Funds changed in planning period 2014-2020: all ESIF projects must have at least one international referee.

Slovak applicants for the Structural Fund projects used to subcontract a consultancy company for the drafting of the proposals – private companies and municipalities in particular. Subcontracting consultancy companies has not been compulsory, but favoured by applicants with limited administrative capacities. Some consultancies were politically affiliated and/or associated with lobbyist groups. Successful applicants used to sign contracts for ‘management, advisory and consultancy services’ and divert part of the project budget to consultancy firms²⁰.

Applications for projects supported from the Structural Funds are evaluated by staff of the implementing agencies and external evaluators:

- Project applications under the Operational Programme Research and Development (OPRD) are evaluated by staff members of the Agency for the Structural Funds of the European Union (ASFEU).
- Project applications under the Operational Programme Competitiveness and Economic Growth (OPCEG) are evaluated by staff members of the Slovak Innovation and Energy Agency (SIEA).

The ASFEU and SIEA are responsible for implementation, monitoring and evaluation of projects supported from the OPRD and OPCEG. The ASFEU and OPCEG lists of evaluators include also external experts.

The Experts recruitment

The Ministry of Education, Science, Research and Sports (MESRS) published two calls (2007 and 2009) for external experts evaluating project applications under the OPRD calls. [Criteria](#) for external experts were rather vague:

- (a) ‘general’ criteria (impeccability);
- (b) ‘professional’ criteria (professional experience with Structural Fund projects and subject of evaluation);
- (c) declaration of no conflict of interest.

Applicants for external experts had to fill in short questionnaire and indicate their education, list of publications, experience with evaluating Structural Fund projects, and experience in particular field of research. External experts are assigned to pool of evaluation experts. They should be (in theory) randomly assigned to Evaluation Committees for project applications under the OPRD calls. The [Statute of Evaluation Committee](#) sets that the committee is created by the ASFEU. The committee has at least five members. Members of the committee are appointed by the Minister of Education. There unfortunately are no clear rules for assigning external experts from pool to shortlist of project evaluators.

²⁰ Slovak media report cases when one consultancy firm benefited from 70 municipal projects (€1.44m) supported from the Regional Operational Programme. Source: Monitoring fondov (27.08.2014): [Ako sa legalne nabalit na eurofondoch](#) {How to legally profit from the European Funds}

The assessment of the expert recruitment process

The National Audit Office (NAO) examined 'system evaluation and selection, and transparency, non-discriminatory arrangements, and fairness' in six calls launched by the ASFEU in period 2009-2012. The calls supported 56 applicants of the OPRD Policy Measures 2.2 and 4.2 with €143.12m²¹. The National Audit Office found²² that

- The ASFEU had no procedures for drafting shortlist of project evaluators;
- Some actual evaluators actually were never included in official pool of internal or external evaluators;
- The MESRS designed Manual for Evaluation and bound the ASFEU to use it for evaluation of the Structural Fund projects. The manual contained list of evaluation criteria and evaluation procedures. The manual, however, 'was imperfect and generated risks of subjective evaluation decisions'. Numerical results of evaluation (based on the point system) were kept separately from qualitative judgements of referees. Separation of numerical and qualitative judgements enabled manipulation of final decisions. The NAO found that in 76 judgements (out of 168 evaluation sheets) numerical results differed from qualitative judgements.
- Beneficiaries of the OPRD projects had to prove Attest of Eligible Research Body. The MESRS provides attest, and keeps and publishes list of attest holders. 37 out of 56 beneficiaries had no attest, but were treated in the same way as the attest holders²³.
- Some 97 ASFEU employees implemented the abovementioned projects, of which 22 quitted their jobs and 25 were acquired in period 2009-2011. The NAO pointed risks stemming from high fluctuation rates of the ASFEU staff. The ASFEU argued, high workload and low pay is reason for high rates of fluctuation.

Slovak media asked ASFEU to publish list of external and internal evaluators (including shortlisted evaluators). The ASFEU argued that names of evaluators are confidential and refused to publish list of evaluators.

The Slovak Government followed the Commission Regulation no 240/2014 and drafted more stringent rules for evaluation of ESIF project proposals in planning period 2014-2020 in November 2014²⁴. The rules are aimed at improving professional quality of potential evaluators. Applicants for evaluating experts have to pass a test of 40 questions. 25 questions are defined by the Managing Authority and 15 by the Government Office. Successful applicants had to answer correctly at least 70% questions. Test questions vary from call to call. Successful applicants are added to central pool of evaluators. Random generator within the ITMS2014+ software environment provides for shortlisting project evaluators to Evaluation Committee. Random assignment is not used in following cases:

- large-scale national projects;
- projects evaluated by joint committee of experts by the Slovak Government and European Commission;
- projects evaluated by foreign experts.

Evaluators for the abovementioned projects are selected by the Managing Authority.

²¹ The calls supported projects for the R&D Centres and Competence Centres. Private firms were recipients of the R&D Centre projects. Universities and the Slovak Academy of Sciences were recipients of the Competence projects, but had to prove collaboration with private firms.

²² National Audit Office (2012): [Správa o výsledku kontroly oprávnenosti výdavkov v rámci Operačného programu Výskum a vývoj](#) {Report on examining eligibility of expenditure by the Operational Programme Research and Development}.

²³ Slovak media pointed to fact that some of the best high-tech Slovak firms did not obtain support from the abovementioned OPRD calls. Support was approved to firms owned by mighty financial groups. Firms with no Attest of Eligible Research Bodies obtained project support €56m. See Hospodarske noviny daily (24.6.2013): [Milióny eur na výskum sa rozdeľovali zvlášťne](#) {Strange allocation of millions of euro for research and development}

²⁴ Slovak Government (2014): [Systém riadenia európskych štrukturálnych a investičných fondov Programové obdobie 2014 – 2020](#) {System of Management of the European Structural and Investment Funds. Programme Period 2014-2020}. Slovak Government Resolution no 586/2014 of 20 November 2014.

In conclusion

Pursuing principles of international peer review sometimes is difficult in Slovakia, not least because the Slovak system of research and higher education is heavily underfunded. It is difficult to find good quality foreign evaluators: grant agencies and accreditation commissions usually engage experts from the Czech Republic (for reason of language and cultural proximity) or Slovak citizens employed in foreign higher education and research institutions.

The Slovak research and higher education system would no doubt benefit from the engagement of peers from outside the Slovak and Czech global diaspora. Infrastructure projects funded from the European resources also may improve allocating mechanisms via engaging international peer reviewers.

7. ENHANCING OR LIMITING THE SYNERGIES?

The Operational Programme Research and Development (OPRD) was major source of finance for Slovak public research institutions in planning period 2007/2013/2015. The OPRD supported three kinds of projects²⁵:

- (i) infrastructure investments in higher education institutions (HEIs) and the Slovak Academy of Sciences (SAS) (Policy Measures 1.1/3.1 and 5.1);
- (ii) networks of centres of excellence in HEIs and SAS (Policy measures 2.1/4.1), and
- (iii) collaborative applied research projects between HEIs and SAS, and private firms.

All Policy Measures contained references to 'support to excellent science' and/or 'co-operation with the EU institutions'. Terms of reference and evaluation criteria, however, gave low weight to excellent science and/or synergies with the FP7 and other ERA activities.

Modernisation and building of technical infrastructure for research and development

The Policy Measures 1.1/3.1 *Modernisation and building of technical infrastructure for research and development* should increase 'ability of research and development institutions to efficiently co-operate with renowned research institutions in the EU' and allocated €110.96 and €25.49m respectively²⁶.

Justification of priority axes 1 and 2 mentioned 'low competitiveness of Slovak R&D organisations in the international context, which leads to their low success rate in obtaining funding from abroad (EU Framework Programmes for research and development, European Science Foundation)'.

The policy measures supported 'systemic priorities' and should 'achieve synergies between the support of research and development from various sources (national budget, businesses, structural funds, funding under FP 7 for research, technical development and demonstration activities)', Eligible Activities (1.1.1, 1.1.2, 1.1.3 and 3.1.1, 3.1.2, 3.1.3), as well as terms of reference for calls under these policy measures did not contain requirement for beneficiaries to prove co-operation with European institutions and/or synergies with the FP7 and other ERA projects.

Transfer of knowledge and technologies from research into practice

Policy Measures 2.1/4.1 *Transfer of knowledge and technologies from research into practice* aimed at 'increase in the quality of research organisations and support to excellent research activities with emphasis placed on areas of strategic importance for the further development of the economy and the society'²⁷. Support to network of excellence was main result of the policy measures. Terms of reference for particular calls under these policy measures indeed contained clauses on potential synergies with the FP7 and other EU initiatives on R&D. The policy measures listed three eligible activities related to international co-operation in R&D:

- 2.1.1/4.1.1 'Support to research exchange and joint research programmes by Slovak research and higher education institutions, and foreign research institutions'.
- 2.1.2/4.1.2 'Support to important R&D projects in 12 strategic thematic areas of the Slovak economy and society'.
- 2.1.4/4.1.4 'Support to international co-operation in R&D' (complementary support to projects financed from the FP7 and support to international networking activities).

Particular calls for the 2.1/4.1 policy measures detailed eligible costs for the abovementioned activities. Eligible cost included capital and current expenditure on international co-operation projects. The FP7 projects

²⁵ Source: The National Strategic Reference Framework: The Operational Programme Research and Development ([English version](#)).

²⁶ The OPRD 3.1 calls were designed for the Bratislava Region. The mirror OPRD 1.1 calls were designed for the non-Bratislava (NUTS II) regions.

²⁷ The OPRD 4.1 calls were designed for the Bratislava Region. The mirror OPRD 2.1 calls were designed for the non-Bratislava (NUTS II) regions.

were mentioned as an example of international co-operation, but were not compulsory for obtaining support under the OPRD calls.

Evaluation criteria for projects implemented under the Policy Measures 2.1/4.1 did not promote support to excellent science and/or synergies with the FP7. An applicant was able to obtain 230 points in total. As for the FP7, applicant was awarded 3 points if its home institution participated in at least one FP7 project and additional 2 points for participation in at least seven FP7 projects anytime in the past (there was no time limit for the past participation). The same number of points was awarded for participation in the national VEGA projects²⁸. The VEGA projects accounted for high-numbers, low support per project and easy-to-pass criteria. Moreover the evaluation criteria did not apply to project team, but to applicant's institution. If a Slovak HEI participated in one or several FP7 projects anytime in the past, the 'excellent science' criterion was OK for all project applications under the OPRD 2.1/4.1 calls.

The 2.1/4.1 Policy Measures launched 3 + 3 calls in 2008-2009. The calls supported creation of 67 Centres of Excellence with €155.48m. Only one pair of calls contained Activity 2.1.4 explicitly aimed at complementary support to projects financed from the FP7. Each call, however, supported several Activities at once and the applicants were free to choose activity they wanted.

Increase the level of cooperation of R&D institutions with the society and economy through the transfer of knowledge and technology

The OPRD Policy Measures 2.2/4.2 aimed at 'Increase the level of cooperation of R&D institutions with the society and economy through the transfer of knowledge and technology, thereby facilitating economic growth of the regions and of the whole Slovakia'. The 2.2/4.2 Policy Measures launched 10+10 calls in 2008-2011. The calls supported co-operation by industry and academia sectors via creation of 98 R&D Centres and 8 Competence Centres²⁹. Calls launched by the abovementioned policy measures aimed at applied research of 'international quality', but did not require applicants to engage in international co-operation under the FP7 and other ERA activities.

The Policy Measures 2.2/4.2 also funded five calls for University Science Parks in the Bratislava Region (€224.74m) and five mirror calls in the non-Bratislava regions (€336.46m) from June 2012 to October 2013.

The calls concentrated on building physical infrastructure of R&D. Most calls did not refer to synergies with the FP7 and other ERA activities. The last calls (launched in November 2013) referred to the RIS3 document and declared goal 'increasing participation rate of Slovak research bodies in Horizon 2020'. Potential applicants had to prove at least five participations in the FP6/FP7 projects in period 2003-2013. These calls were tailored for the SAS and top HEIs. Projects on the University Science Parks complete by end of 2015.

In Slovakia there were no initiatives aimed at fast tracking for proposals submitted under FP7/H2020, above the thresholds but not successful.

Have the OPRD calls supported excellent science?

Most investments under the OPRD aimed at the infrastructure building and concentrated in 2013-2015. Results of these investments are yet to be seen. Some OPRD calls (Policy Measures 2.1/4.1 and 2.2/4.2) explicitly aimed at building Centres of Excellence, R&D centres and Competence Centres. Spending rates by these projects (except for the University Science Parks) stood by 70-80% by end of 2013. The 2013 Annual Report on Implementation of OPRD states some output and impact indicators for the Priority Axes 2 and 4 of the OPRD (Policy Measures 2.1/4.1 and 2.2/4.2). By end of 2013 the OPRD calls supported mere 72 publications in the SCI/SSCI journals and 3261 publications in other journals. The project beneficiaries set respective targets 3970 and 6192 publications. It seems that beneficiaries set overambitious targets for publishing in good quality journals, but were not able to match these targets by end of 2013. The OPRD for some reasons set no output / impact indicators for numbers of co-operations under the FP7 or other ERA projects.

²⁸ Source: Terms of reference, Annex 10 – Evaluation Criteria for Priority Axis 2 of the Operational Programme Research and Development.

²⁹ Evaluation criteria for calls launched by the Policy Measures 2.2/4.2 (Support to R&D Centres and Competence Centres) were almost identical.

The Operational Programme Research and Innovations (OPRI)

The Operational Programme Research and Innovations (OPRI) is key source of support to Slovak R&D in period 2014-2020. The OPRI, *inter alia*, declares goal on increasing synergies between the ESIF and Horizon 2020 funding. The goal is to be achieved in two ways:

- (i) cutting administrative burden for the ESIF calls, and
- (ii) introducing support measures for synergies between the ESIF and Horizon 2020.

The OPRI recognised that the Structural Funds provided Slovak HEIs and public research bodies with significant amount of money, but at high administrative costs in planning period 2007-2013/15. Slovak public institutions concentrated on the OPRD project applications and skipped the FP7 projects. The Investment Priority 1.1 'Broadening research and innovation infrastructure and capacities for excellent research and innovations, and support to competence centres (of European significance in particular)' contains Activity 1.1.2 'Increasing participation of Slovakia in international co-operation projects'.

The Activity states following goals:

- Increasing level of excellence by Slovak science;
- Increase in number of the Horizon 2020 project proposals submitted by Slovak participants;
- Increase in numbers of successful Horizon 2020 project proposals;
- Increase in participation in international activities, in international and European programmes in particular;
- Increase in the EU contribution via increased numbers of the successful project proposals.

The goals will be achieved via support to

- synergic and complementary projects under Horizon 2020, the Danube Strategy, Eureka, Eurostars, Erasmus+, etc. Complementary finance should be automatic for all successful projects in the abovementioned initiatives;
- fast tracking for proposals submitted under FP7/H2020, above the thresholds but not successful ('shortlisted projects'). Support is provided for projects with thematic focus identical with thematic areas stated in the RIS3 document;
- horizontal participation of Slovakia in ERA. Activities under consideration includes Slovak Liaison Office for R&D in Brussels, and support structures for Horizon 2020 (including national contact points);
- participation in other international R&D activities (ERA-NETs, EURAXESS, technology platforms, etc.);
- creation of national technology platforms. The national platforms are considered important for Slovakia's participation in the European Technology Platforms and Joint Technology Initiatives (as far as they are compatible with thematic areas defined by the RIS3 document).

The output indicator for Activity 1.1.2 is '80 international projects in non-Bratislava regions' by 2023. Investment Priority 2 mirrors Priority 1 in the Bratislava Region. The Investment Priority 2 states identical goals in international co-operation in research and development, but for some reasons sets no output indicators for the Bratislava Region.

The first calls under OPRI are expected in 2015.

8. TAKE-UP OF PUBLIC SECTOR RESEARCH RESULTS

Two Operational Programmes supported take-up of public sector research results by businesses. The programmes invested over €400m to projects on industry and applied research in period 2008-2013/15.

In the Operational Programme Competitiveness and Economic Growth (OPCEG)

The industry research projects were supported from the Operational Programme Competitiveness and Economic Growth (OPCEG) via Policy Measure 1.3 'Support to innovation activities in enterprises'. Slovak firms were eligible applicants for the OPCEG 1.3 projects. The applicants were expected to co-operate with public research institutions. Efficiency of policy instrument is difficult to assess, as most project were still running by end 2014, but the overall efficiency seems low. The OPCEG supported some 88 industry research projects (€100.8m), of which just six were concluded by end of 2014. Machinery (including robotics), energy distribution and saving, and electrical engineering accounted for majority of supported projects. For some reasons, the applicants were not asked to report numbers of patents and/or industrial designs.

There was some accidental evidence of successful (concluded) projects:

- The SPINEA Plc and the Slovak University of Technology in Košice developed a project on 'Research and experimental development of new types of reduction gears for low-moment and high-precision actuators and drivers for mobile and manipulation platforms'. The SPINEA is a Slovak engineering company, engaged in development, manufacturing and sales of high-precision reduction gears, which are sold under the trademark TwinSpin. The TwinSpin high precision reduction gears are serially manufactured based on an international patent. Spin high-precision reduction gears are designed for applications requiring a high reduction ratio, high kinematic accuracy, low lost motion, high moment capacity and high stiffness of a compact design with a limited installation zone, and low mass. This new transmission system allows the utilization of the reducer TwinSpin in robotics and automation, machine tools, measuring equipment, navigation systems, in the aircraft industry, in military and medicine field, in wood-working field, in printers branch, in machines for textile industry and glass treatment, in filling machines, etc. Total eligible costs of the project were €1.03m, of which company provided €0.54m, ERDF €0.42m and Slovak State Budget €0.07m in period 2010-2013. The company got another two OPCEG projects (€14.15m) on technology transfer in 2009-2014.
- The Kybernetes LTD in Košice is active in applications of cybernetics, automation, robotics, artificial intelligence and IC technologies in industry. The company won project on 'Adaptive Regulators for Online Optimisation in Technology Processes' (RODIAN). The project was successfully concluded and firm sold its product in Slovakia and abroad. The regulator is based on principles of artificial intelligence. The project had total budget €0.57m in period 2011-2013. The firm co-operated with the Technical University of Košice, Department of Cybernetics and Artificial Intelligence. The firm got another OPCEG project (€0.44m) with similar theme for period 2014-2015.

In the Operational Programme Research and Development (OPRD)

The Operational Programme Research and Development (OPRD) supported applied research projects via the Policy Measures 2.2 and 4.2 'Transfer of technologies from research to practice'. Eight calls launched under the Policy Measures 2.2/4.2 were aimed at public research institutions and six ones at businesses in the non-Bratislava regions and the Bratislava Region.

- i. Projects for businesses were implemented via the State Aid schemes and had indicative allocations €0.25-3.0m per project. Businesses were expected to form partnerships with public research institutions. Three calls allocated €112.98m to 76 projects in the non-Bratislava regions and three calls €62.29m to 38 projects in the Bratislava Region.
- ii. Projects for public research institutions (Universities, Slovak Academy of Sciences and other public bodies) had indicative allocations €0.13-6.0m per project. Four calls allocated €111.75m to 120 projects in the non-Bratislava regions and four calls €57.74m to 45 projects in the Bratislava Region. Applicants were encouraged to form partnerships with other public research institutions, but not with businesses. The calls supported 'independent research oriented at practice'. Project holders had to

produce 'technologies, technology processes and prototypes'. The project holders (public research bodies), in the same time, were prohibited to use prototypes for commercial purposes.

Efficiency of the take-up of public sector research results seems low. The Priority Axes 2 and 4 of the OPRD set cumulative targets the EPO patent applications (46+39) and numbers of spin-offs (33+39) by 2015.

The 2013 Annual Report on Implementation of the OPRD stated, there was no EPO patent application and no spin-off reported by the project holders. Numbers of EPOs and spin-offs should be known after official end of projects. The Annual Report also states two examples of good practices for the Policy Measures 2.2 and 4.2. Project results are reported in terms of publications, conferences organized, popular science outputs and number of doctoral students. No commercial outputs were reported.

9. COUNTRY TAILORED POLICY SUGGESTIONS

Quality of Governance

A lack of co-operation and information sharing between the respective Ministries of Economy and Education appears to have been at least one of the reasons for the relative underperformance of the Slovak R&D and innovation policies. The RIS3 document made it clear how this situation is improved in the current programme period. One positive sign has been the inter-departmental approach taken to the development of the RIS3 process. Chapter 5 sketches some impressive plans for *'changing existing structure of state science, technology and innovation policy that ultimately will be for the development of all these policies responsible only supreme authority, which will also be responsible for the efficient funding of science, technology and innovation'* and *'re-creating a separate budget chapter "Science and Technology" and reintroducing binding ratio to ensure stable funding for science and technology from the state budget'*. These plans are still at odds with the current allocation of competences within the Slovak Government.

The Slovak Government established the Government Council for Science, Technology and Innovation (SGCSTI) in 2011 as the senior organ for the development, co-ordination and implementation of RDI policies in the Slovak Republic. The Council met first time in 2013 to discuss the concept for the RIS3 document. The Council is chaired by the Prime Minister. The Council in fact is *'a permanent advisory, initiative and coordinating body of the Slovak Government for area of science and technology and innovation'* and *'the Council activities do not interfere with competences and responsibilities of the Ministries and other bodies of the central government for science, technology and innovation'*³⁰. The incumbent Statute of the Council is explicit about the fact that the Council has no implementation powers. These powers remain in hands of the Ministries of Education and Economy respectively. The efficacy of the approach therefore depends on the extent to which the Council is able to build up moral authority, but also is supported by the various participants and stakeholders. The Council is a cross-cutting body and involves representatives of *inter alia* key central government ministries, HEIs, research institutions, industry and employer associations. The main task of the Council is to reduce fragmentation and secure effective work of the public R&D&I institutions.

The new governance system needs urgently to find a way to address problems of co-ordination of R&D&I policies, not just addressing the most superficial problems, and co-ordinate not just policy actors, but also those delivering research activities, and align them around common goals, priorities, strategies, approaches and timescale. The overall governance problem can be characterised as one of co-ordination between a small number of separate, strong Ministries used to operating in their own rigid hierarchies. The new arrangements must fully account for that. Providing both administrative solutions but arguably more important than that is the leadership to create administrative capacity. In contrast to the current hierarchical arrangements, the new system should stress the interaction and shared learning between the different layers of the system. It is a matter of Slovak government to design and manage its own system of R&D&I governance bodies. The system, however, will be responsible for the implementation of programmes worth €2.3bn provided from European resources and must do so in transparent and efficient ways. Some policy measures listed in Chapter 6 of the RIS3 document already have been place for a decade in Slovakia (seed capital funds, micro-loan programmes, guarantee schemes), but have thus far had a limited success³¹ and some instruments have had problems, such as mismanagement of funds³².

Chapter 6 of the RIS3 document presents far-reaching plans for

- Merging incumbent eight R&D&I government agencies to two ones: the Science Agency and the Technology Agency. The Science Agency will be part of the MESRS, while the Technology Agency part of the Ministry of Economy. Both agencies, however, are supposed to be 'advised' by the SGCSTI.
- Changing shares of support to basic and applied research from current ratio of 2 : 1 to 1:2 by 2022.

³⁰ Source: Slovak Government (2013): *Statute of the Government Council for Research, Development and Innovations* (Article 1); Government Resolution No. 114 of 27 February 2013.

³¹ The 2009 Review of Risk Capital Schemes in Slovakia by the Ministry of Finance found a relatively low interest in risk capital schemes by innovative businesses. The Review, for example, revealed that the Fund of Funds scheme has supported 155 projects with approximately €19.729m since 1994, but there was no evidence to suggest how many of these were very innovation-oriented.

³² The Slovak Government identified problems with corruption and mismanagement of national and European resources in the NADSME in 2010. In June 2011 the Slovak Government decided to shift all programmes supported from the Structural Funds from the NADSME to the Slovak Innovation and Energy Agency.

- Introducing 'mandatory indicator of the state support to R&D as per cent of GDP in the State Budget Law'.
- Re-organisation of the HEIs, transformation of the Slovak Academy of Sciences.

Slovakia currently has a government formed by a single party, and this represents a unique opportunity. Slovakia normally has multi-party coalitions with the Ministries of Education and Economy split between the different ruling parties, which in turn makes co-ordinated action between the Ministries hard for primarily party political reasons. The current opportunity represents a unique chance for reforming system of R&D&I governance. If no reforms are made before a coalition government is formed, co-operation by actors and stakeholders behind various Ministries may be more difficult in the future³³.

Factors that support or limit the national participation in R&D calls funded by ESIF

As for the ESIF investments, Chapter 6 on Strategic goals of the S3 document contains several suggestions on future plans for the development of strategic infrastructure. Policy Measure 2.2 'Development of research and development infrastructure' proposes two activities

- (2.2.1) Development of existing University science parks and research centres at universities and SAS; and
- (2.2.2) Support for building national infrastructure for the use of structures ESFRI.

Measure 2.2 plans to invest €1250m from the public and private resources. Infrastructure projects supported under this policy measure should favour successive projects on University Science Parks and aim at completing R&D infrastructure in selected thematic areas. Thematic specialisation of the R&D Centres should prevent duplications in research investments.

Support structures for the FP7 programme proved inadequate. The PSPFP7 programme in particular invested very low resources to initial stages of project proposals. The Operational Programme Research and Innovations provides abundant financial resources for excellent science. Some of these resources should support early stages of drafting Horizon 2020 projects.

Slovak HEIs and public research institutions significantly lag behind the EU standards, but also behind their regional competitors from the Czech Republic and Hungary. No Slovak HEI made it into the list of top 500 research institutions in the SCIMAGO ranking. Slovak students already are voting with their feet and study in the Czech Republic, Austria and the UK. Slovak Government must be more active in stopping brain drain and wasting public money on poor quality education. Current system of block institutional funding discourages excellence and promotes mediocrity. Efforts put in excellent science are not rewarded by adequate co-financing from state budget. The criteria for block grants to public HEIs should change in such way, as to favour high-quality publications over numbers of students and/or mass production of low quality publications.

Chapter 2.5 of the S3 document mentions plans by the Slovak Government for (a) transformation of the Slovak Academy of Sciences from the State to a Public R&D Institution and (b) re-designing the system of public financial support to higher education. The plans aim at increasing the importance at a systems level of applied research, commercial R&D outputs and elite Universities. Chapter 6 on Strategic goals identifies four key strategic policy targets, of which Target 4 refers to 'Improving the quality of the human resources for an innovative Slovakia'. The target contains Measure 4.2 'Improving the quality of higher education'. The measure supports several important activities

- (4.2.1) Implement the measures recommended in the audit report European University Association;
- (4.2.2) Amend institutional funding to strengthen the financing of excellent public Universities especially in the field of engineering and natural science to better fill up mission RIS3, and

³³ The Annex of the 2014 National Reform Programme contained lists of policy initiatives in the reform of science and technology. The most important actions included (i) support for building technology transfer centres; and (ii) amendments to the 172/2005 Law on the Organisation of State Support for Science and Technology and the 185/2009 Law on R&D Stimuli. Introduction of the R&D tax stimuli was the only important initiative adopted by mid-2015. No reform of higher education was planned before the 2016 elections. The Slovak Government also stopped reform of the Slovak Academy of Sciences in June 2015.

- (4.2.3) Change categorization of Universities so that they reflected the specific mission of Universities and mission of specific activities (study programs ...).

These activities are of high importance to the success of the S3 Strategy. Their successful implementation will be dependent upon amendments of some key laws specific to higher education. The S3 Strategy does explicitly identify laws and regulations to be amended in Chapter 5.2. Law on public research institutions (PRI) and transformation of the Slovak Academy of Science to PRI is under way. The 2014 National Reform Programme stated that new law on higher education would be drafted and passed in 2014. No such law was drafted in 2014.

Concerns regarding the evaluation & Difficulties encountered at the stage of proposal drafting for SF/ESIF calls

Managing and implementation authorities should :

- secure good quality peer review and evaluation mechanisms;
- insulate from influence of lobbyist groups;
- slash administrative costs of project applications and management;
- provide for fair treatment of applicants;
- avoid biased decisions and minimise risk of manipulation with evaluation results;
- design transparent rules for ex ante and ex post evaluation mechanisms.

National and OPRI projects with higher budgets should use international peers only, as to limit potential conflict of interest.

Independent international peer review may help combat lobbying and misallocation of public resources. Managing and implementation authorities may consider creating database of prospective international evaluators for particular project themes.

All project proposals with higher budgets should be in English, as to remove reliance on Czech experts and/or Slovak nationals living abroad.

Costs of evaluation should be included either in technical assistance (ex-ante) or project costs (ex-post). Managing / implementing authority should check whether a consultancy firm (or group of firms) does not appear in too many projects.

Difficulties during the implementation of the projects

Administrative burden for the ESIF projects must be kept at minimum, as not to drain HEIs and SAS administrative resources and divert them from the Horizon 2020 applications.

There must be clear and transparent rules for (i) selecting experts to broad pool of evaluators and (ii) shortlisting experts to evaluator committees.

Names of evaluators must be made public upon request. Managing and implementation authorities must perform entry test for applicants and find whether they passed eligibility criteria. Managing and implementation authorities must secure adequate numbers of well-trained staff and minimise fluctuation of employees.

The ESIF calls on R&D are designed for research performers. The Ministry of Education, Science, Research and Sports (MESRS) manages list of Eligible Research Bodies³⁴. The MESRS may consider directly contacting all these bodies each time a call from the ESIF is launched. The MESRS also may indicate, which bodies are eligible for particular types of calls.

Facilitating mechanisms during the draft proposal/ implementation

Project applicants cannot always know, what kind of equipment and/or material would they need in advanced stages of their projects. They have to detail all items in the project proposal, but are not allowed to change

³⁴ There were some 484 Eligible research bodies listed with the MESRS by January 2015.

list of items during implementation phase. Project teams should be given higher flexibility in project spending³⁵.

Modern forms of public procurement (pre-commercial procurement of innovation, pre-commercial public procurement, competitive dialogue) have not been used in the Structural Fund schemes in programming period 2007-2013/15, but are highly recommended for current planning period in Slovakia.

Independent foreign evaluators could assess early stages of project proposals. The best project ideas could be encouraged to develop to full proposals, while average projects could be stopped in early stages.

Enhancing or limiting the synergies?

Calls supported from national resources (VEGA, RDA) and European Funds (OPRI) should promote synergies with the Horizon 2020 and other ERA activities:

- Synergy with the ERA activities should not be optional, but compulsory for all calls supporting excellent science.
- Evaluation criteria for projects implemented under the national grants and the OPRI should give substantial weight to actual experiences with the FP7/Horizon 2020 and other ERA activities.
- Points for past participation in the abovementioned activities should reflect experience of the project team in last 5 years and not all projects amassed by team's parent institution anytime in the past.
- At least one OPRI call should be aimed at projects shortlisted for Horizon 2020 (fast tracking for proposals submitted under H2020, above the thresholds but not successful).
- Project monitoring and evaluation should note whether project targets are realistic. System of monitoring and evaluation should also reward projects with truly excellent results and penalise substandard results.

³⁵ This section based on the interviews performed by the author with managing authorities.

10. REGIONAL ANALYSIS

The Slovak NUTS II regions accounted for diverse levels of the economic and the R&D&I development:

- **The Západné Slovensko Region** was the second richest Slovak region in terms of per capita GDP. The region significantly benefited from influx of the FDI. It concentrated some 14.0% of the total FDI in Slovakia in period 1990–2013. Most investments targeted car-assembly and car component industries (Peugeot Citroen Trnava, Sauer-Danfoss Považská Bystrica), manufacture of tyres (Continental Púchov) and manufacture of consumer electronics (Foxconn Nitra, Samsung Galanta). As for the NUTS III level, intensity of research and development (R&D) was considerably higher in the Trenčín Region and the Trnava Region than in the Nitra Region (Table 9). The regional R&D system likely benefited from entry by multinational companies, but details on research spending and employees by private firms generally were scarce. Manufacturing of electrical engineering, cars and car components, TV-sets and displays, chemicals and plastics generated significant part of region's employment, output and exports. Structure of production and exports was reflected in regional structure of research activities. Engineering and agriculture sciences were the most important science fields in the region in 2013.
- **The Stredné Slovensko Region** accounted for significant north/south division on terms of economic development. The northern districts benefited from influx of foreign direct investments (FDI). Most important investments were channelled to car assembly and car components production (Hyundai-Kia Žilina, Volkswagen Martin), and paper and pulp industry (Mondi Ružomberok). Several districts in southern part of the Banská Bystrica Region had unemployment rates over 25% and ranked to the poorest ones in Slovakia. Export-oriented manufacture of cars and car components, machines, steel pipes, and pulp and paper were the most important industries and accounted for significant share of value added and employment in the region. Structure of production and exports was reflected in regional structure of research activities. The most important science fields in the region were engineering, nature sciences and agriculture sciences in 2013 (Table 9).
- For decades **the Východné Slovensko Region** has been the poorest region in Slovakia in terms of regional GDP, wages and employment. The region experiences drastic economic shock in early 1990s during initial phases of economic transition. Many regional companies lost their customers in the central and Eastern Europe and were unable to compete under market economy. Export-oriented manufacture of metals and metal products, manufacture of car components, machinery, chemicals and chemical fibres were most the important industries and accounted for significant share of value added and employment in the region. Engineering and nature sciences were the most important science fields in the region in 2013 (Table 9).
- **The Bratislava Region** was the richest region in Slovakia. It benefited from excellent infrastructure, considerable stock of human capital and influx of foreign direct investment (FDI). The region has been driving force of the Slovak economy. It concentrated some 69.9% of the FDI in Slovakia in period 1990–2013. The most important firms included Volkswagen (automotive industry), Slovnaft (oil processing), SPP (gas storage and distribution), Slovak Telecom (information technologies), INA Skalica (car components), SAS Automotive (car components), Johnson Controls International (car components), Delphi Slovensko (car components) and many financial groups. Bratislava is the major centre of R&D activities. The region accounted for over half of total Slovak researchers and some 70% of total research outputs in terms patents and scientific publications (Table 9). The R&D capacities in Bratislava, however, are mostly supported by the central government, and/or large enterprises. Bratislava got its own Operational Programme Bratislava Region in the planning period 2007–2013/15. Significant part of the programme supports R&D, innovation and human resources. The programme was designed, implemented and monitored by central authorities (comments by regional government were taken into account). Total budget of the programme (€82m) is allocated to R&D and HEI sector. The Bratislava Region also benefits from the Operational Programme Research and Development (OPRD, see Table 10 for more details).

Table 9: Basic indicators of regional R&D capacities and performance in Slovakia in 2013

NUTS II Region		Western Slovakia			Central Slovakia		Eastern Slovakia		
NUTS III Region	Bratislava	Trnava	Trenčín	Nitra	Žilina	Banská Bystrica	Prešov	Košice	Slovakia – national totals
R&D personnel in FTE	8869	1001	695	1327	1184	1030	637	2424	17168
of which researchers	7678	874	555	1139	909	875	537	2161	14728
GERD total, €m	346.92	29.19	31.34	20.19	61.88	33.18	19.81	68.42	610.88
of which capital exp.	36.19	7.06	3.41	3.36	19.29	9.02	3.32	4.52	86.17
GERD by type, %									
basic research	43.8	43.4	10.9	56.0	37.0	43.3	43.6	66.1	44.1
applied research	13.9	27.6	37.5	30.2	44.0	46.1	11.8	10.8	20.0
development	42.3	29.1	51.6	13.8	19.0	10.6	44.5	23.1	36.0
GERD by field of science, %									
natural science	23.5	1.7	2.5	13.8	6.2	10.2	18.6	17.2	17.7
engineering	43.2	75.7	96.8	27.4	74.2	46.8	55.9	45.9	51.0
medical	10.4	2.5	0.2	0.0	13.3	4.8	6.7	9.9	9.0
agricultural	0.0	3.7	0.0	27.1	0.5	16.9	0.1	10.2	3.2
social science	7.1	10.9	0.5	19.5	2.2	13.2	3.6	11.1	7.5
humanities	15.9	5.5	0.0	12.2	3.6	8.2	15.1	5.7	11.6
BERD total, €m ¹⁾	213.95	13.85	28.64	7.29	41.54	20.83	10.37	36.79	373.26
Share GERD/GDP, % ²⁾	1.74	0.35	0.45	0.24	0.78	0.54	0.31	0.83	0.83
Share BERD/GERD, % ¹⁾	61.7	47.5	91.4	36.1	67.1	62.9	52.3	53.8	61.1

Sources: The Statistical Office of the Slovak Republic and author's own computations. Notes: 1) By source of funding. 2) Based on actual data on regional R&D spending and estimated data on regional GDP for 2013. GERD = Gross research expenditure on R&D; BERD = Business expenditure on R&D. FTE = Full time equivalent. The Bratislava, Western Slovakia, Central Slovakia and Eastern Slovakia are NUTS II regions. The Trnava, Trenčín, Nitra, Žilina, Banská Bystrica, Prešov and Košice are NUTS III regions.

Regional governance of the R&D&I

There are no self-governing regions on the NUTS II level in Slovakia. Slovakia is divided into 8 NUTS III self-governing regions. Degree of institutional autonomy by NUT III regions is quite low and excludes research and innovations.

R&I are traditionally considered matters of central government in Slovakia. No explicit regional R&D programmes and policy initiatives have been developed so far in Slovakia. The Smart Specialisation Strategy contains no reference to regional R&D&I programmes. So far, only regional innovation strategies have been developed and adopted by the regional governments. The NUTS III regions indeed draft their regional innovation strategies (essentially 'wish lists'), but all SF/ESIF policies are developed and implemented via the central government agencies.

The Slovak NUTS III regions used European resources to fund drafts of the regional innovation strategies (RIS). Two generations of the RIS documents were drafted and adopted by the regional parliaments: 2004/8-2013 and 2014-2020 RIS documents. The Bratislava Region was the first Slovak NUTS III region to produce new RIS3-type strategy in Slovakia in 2013. The Regional Research and Innovation strategy (RIS3) of the Bratislava Region for 2014-2020 aims at 'building research and innovation region interconnected with

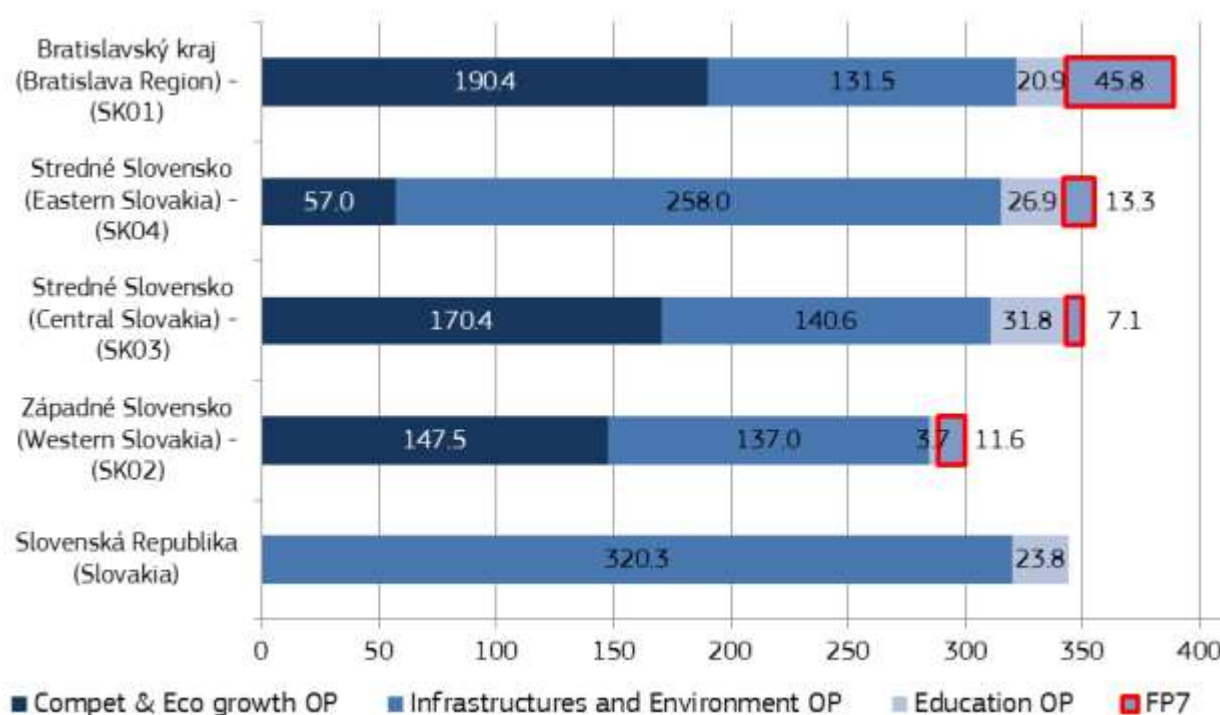
European and World economy and achieving critical mass of the technology-based firms'. The key stakeholders include the Bratislava Region and the Bratislava City governments, Slovak Ministry of Education, major businesses, two Universities and the Slovak Academy of Sciences. The Strategy is based on 'smart specialisation' concept, and identifies three key technology themes (i) material science, (ii) information and communication technologies, and (iii) biotechnologies. The 'horizontal' priorities include: (a) support to pro-innovative business environment for small and medium enterprises, (b) eco-innovations, (c) social innovations, (d) 'digital economy and society', and (e) cluster development. The support measures aim at building material infrastructure, regional innovation governance system, and financial resources for innovations. The Bratislava Region hopes to invest about €500m from the Structural Funds to implement the RIS3 document in period 2014-2020. Real allocations depend on calls by the Operational Programme Research and Innovations. First calls are expected in 2016.

Regional allocations of the Structural Funds

The Operational Programmes (OPs) are implemented by the central government agencies in Slovakia. Difference in spending rates by particular OPs relate more to ability of these agencies to design and implement calls than ability by regional governments to design their regional innovation strategies. Table 10 presents allocations and spending rates by the Operational Programme Competitiveness and Economic Growth (OPCEG), the Operational Programme Research and Development (OPRD) and the Operational Programme Education (OPE). Absorption capacity in terms of human resources and quality of research institutions also is important for spending rates by the Slovak NUTS II and NUTS III Regions.

The Stredné Slovensko and the Východné Slovensko (NUTS II) Regions were the poorest parts of the Slovak Republic and accounted for the lowest spending rates by 30 April 2015 (50.0% and 46.5% respectively). The Západné Slovensko and the Bratislava regions were the most developed parts of Slovakia and accounted for slightly higher spending rates (51.8% and 59.9% respectively).

Figure 3: Regional breakdown of FP7 EU Contribution received by the country



Source: European Commission, JRC-IPTS (2015), Stairway to Excellence Facts and Figure: Slovakia

Table 10: Allocations by most important Structural Funds in field of research, innovations and education in the Slovak NUTS II and NUTS III regions, €m as of 30.04.2015

NUTS II	NUTS III	Operational programme	Contracted projects, €m			Certified spending, €m			Spending rate, %
			EU	State Budget	Total	EU	State Budget	Total	
Bratislava	Bratislava	OPCEG	36.5	6.4	43.0	21.2	3.7	25.0	58.2
		OPRD	363.4	56.3	419.6	220.3	35.6	255.8	61.0
		OPE	24.0	4.0	28.0	11.0	1.8	12.8	45.8
		Total	423.9	66.7	490.6	252.5	41.1	293.6	59.9
Stredné Slovensko	Banská Bystrica	OPCEG	188.4	32.1	220.6	98.3	16.7	115.0	52.1
		OPRD	73.0	10.1	83.1	53.9	7.3	61.2	73.7
		OPE	34.0	4.2	38.2	17.9	2.2	20.1	52.7
		Total	295.3	46.5	341.8	170.1	26.2	196.3	57.4
	Žilina	OPCEG	126.2	21.8	148.0	50.5	8.7	59.2	40.0
		OPRD	160.0	19.9	179.9	91.2	11.3	102.5	56.9
		OPE	39.7	5.2	44.8	21.7	2.8	24.5	54.7
		Total	325.9	46.8	372.7	163.4	22.7	186.2	50.0
Východné Slovensko	Košice	OPCEG	107.3	17.6	124.9	50.6	8.3	58.8	47.1
		OPRD	142.7	18.8	161.5	96.6	13.1	109.7	67.9
		OPE	50.8	6.7	57.5	29.5	3.8	33.3	57.9
		Total	300.8	43.1	343.9	176.6	25.2	201.8	58.7
	Prešov	OPCEG	211.7	35.8	247.5	83.6	13.5	97.1	39.2
		OPRD	53.2	7.9	61.1	36.2	5.1	41.2	67.5
		OPE	49.7	6.4	56.1	27.8	3.5	31.3	55.7
		Total	314.7	50.1	364.7	147.5	22.0	169.6	46.5
Západné Slovensko	Nitra	OPCEG	135.4	22.7	158.1	75.2	12.3	87.6	55.4
		OPRD	86.4	11.1	97.5	47.1	6.2	53.2	54.6
		OPE	26.8	3.3	30.0	14.7	1.8	16.5	55.0
		Total	248.5	37.1	285.6	137.0	20.3	157.3	55.1
	Trenčín	OPCEG	92.5	16.0	108.4	40.8	7.0	47.8	44.1
		OPRD	14.8	2.2	17.0	9.2	1.2	10.4	61.4
		OPE	18.9	2.5	21.4	11.8	1.6	13.4	62.6
		Total	126.1	20.7	146.8	61.9	9.8	71.7	48.8
	Trnava	OPCEG	81.1	13.4	94.5	33.0	5.1	38.1	40.3
		OPRD	97.1	12.4	109.5	58.2	7.4	65.6	59.9
		OPE	22.3	2.8	25.2	13.3	1.7	15.1	59.8
		Total	200.5	28.7	229.1	104.5	14.2	118.7	51.8
Slovak Republic Total			2235.7	339.6	2575.3	1213.6	181.6	1395.2	54.2

Sources: The National Strategic Reference Framework: Absorption and list of projects, and author's computations.

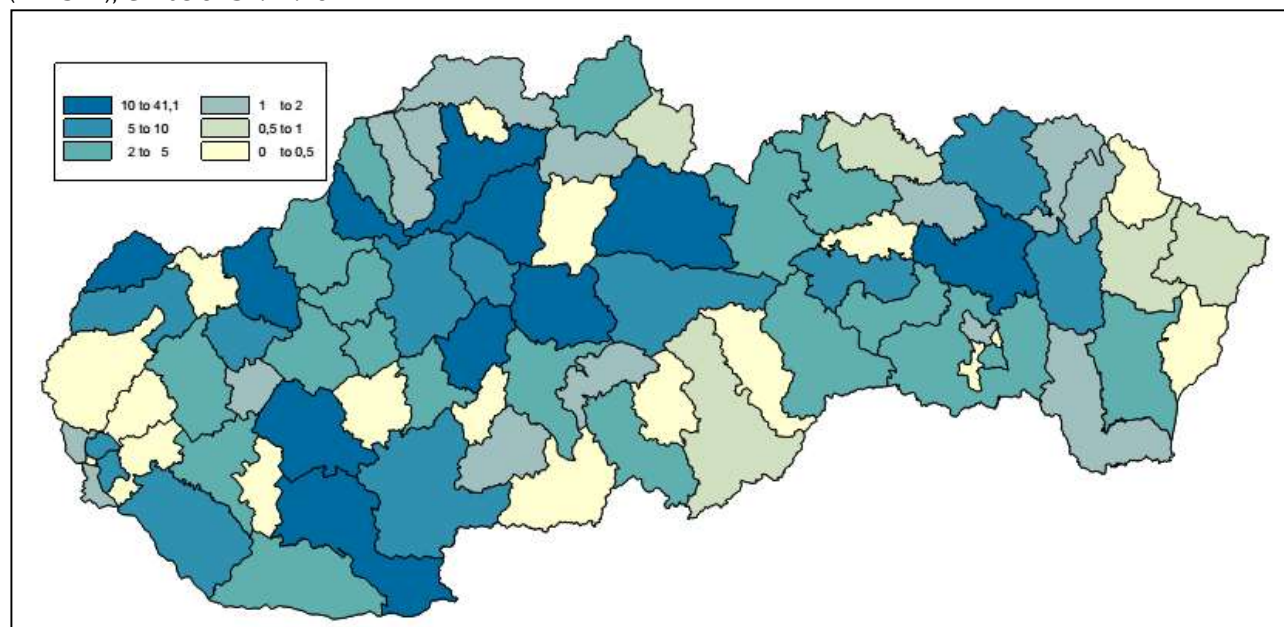
Figure 1 provides details on the SF allocations on the NUTS II level. Figures 2 and 3 provide detailed overview of the regional allocations on the NUTS IV level (79 Slovak districts). Figure 3 displays allocations of the OPCEG 1.1 and 1.3, and OPBR 2.1 Policy Measures. The OPCEG 1.1 and 1.3 Policy Measure primarily targeted innovations and technology transfers in the non-Bratislava Regions. The OBPR 2.1 Policy measure mirrored these targets, but with substantially lower allocations in the Bratislava Region. The Policy Measures OPRD 2.1/4.1 and 2.2/4.2 supported excellent science and knowledge transfers respectively in the non-Bratislava / Bratislava regions. The Bratislava Region again received much lower allocations than other (NUTS II) regions in Slovakia.

The regional breakdown of the financial allocations by the Structural Funds indicates that most OPCEG 1.1 and 1.3 projects were absorbed by industrial districts of western and northern Slovakia and the Prešov region. The most developed Slovak region (Bratislava) did not qualify for assistance under the Objective 1. The OPRD

2.1/4.1 and 2.2/4.2 projects mostly aimed Universities and were allocated to regional capitals. Cities of Košice, Bratislava, Žilina, Trnava and Nitra concentrated most allocations by the abovementioned projects.

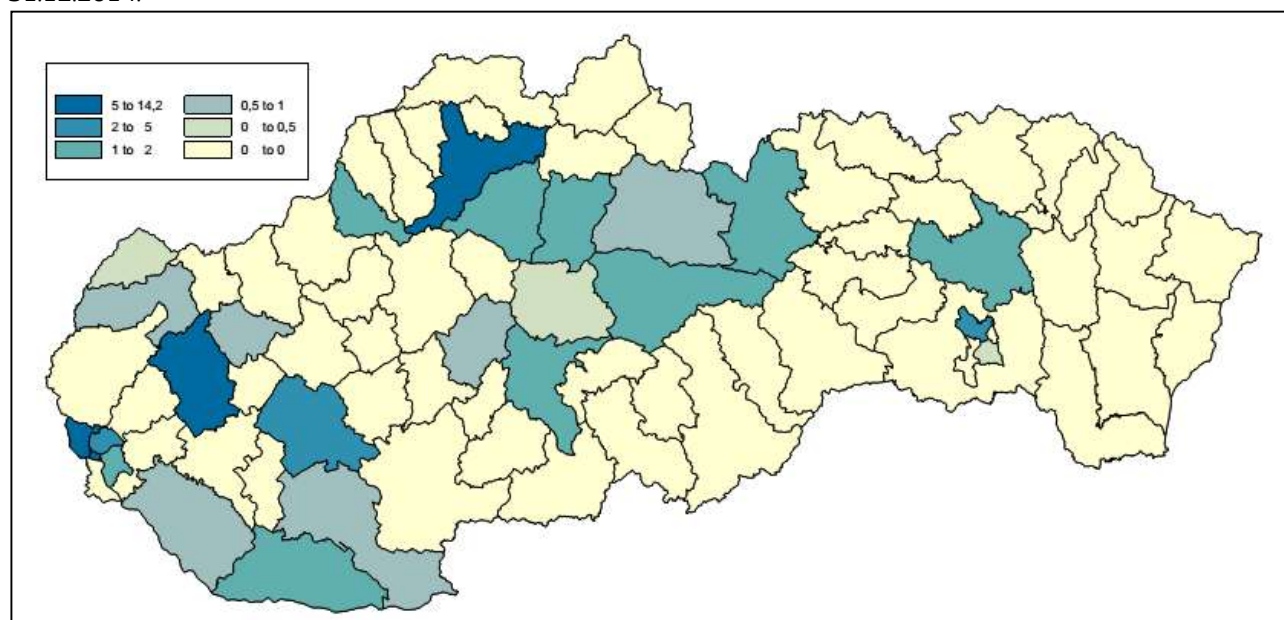
Regional structure of financial allocation therefore more or less matched economic structure of the country. The optimal allocation, however, would concentrate the R&D investment to the Bratislava Region.

Figure 2: Financial allocation by the OPCEG 1.1 and 1.3, and OPBR 2.1 Policy Measures in Slovak districts (NUTS IV), €m as of 31.12.2014



Sources: The National Strategic Reference Framework: Absorption and list of projects, and author's computations. Actual expenditure by the Structural Funds by 31.12.2014.

Figure 3: Financial allocation by the OPRD 2.2 and 4.2 Policy Measures in Slovak districts (NUTS IV), €m as of 31.12.2014.



Sources: The National Strategic Reference Framework: Absorption and list of projects, and author's computations. Actual expenditure by the Structural Funds by 31.12.2014.

11. ABBREVIATIONS

ASFEU	Agency for Structural Funds of the Ministry of Education, Science, Research and Sports (Agentúra pre štrukturálne fondy Ministerstva školstva, vedy a výskumu SR)
BERD	Business Expenditures for Research and Development
CERN	European Organisation for Nuclear Research
ERA	European Research Area
COST	European Cooperation in Science and Technology
ERA-NET	European Research Area Network
ESA	European Space Agency
ESFRI	European Strategy Forum on Research Infrastructures
FP	European Framework Programme for Research and Technology Development
ESIF	European Investment and Structural Funds
EU	European Union
EU28	European Union including 28 Member States
FDI	Foreign Direct Investments
FP	Framework Programme
FP7	7th Framework Programme
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GOVERD	Government Intramural Expenditure on R&D
GUF	General University Funds
HEI	Higher education institutions
HERD	Higher Education Expenditure on R&D
HEIs	Higher education institutions
HES	Higher education sector
IP	Intellectual Property
KEGA	KEGA Grant Agency (Grantová agentúra KEGA)
NRIR	National Research Infrastructures Roadmap
PRO	Public Research Organisations
OECD	Organisation for Economic Co-operation and Development
OPCEG	Operational Programme 'Competitiveness and Economic Growth' (Operačný program Konkurencieschopnosť a hospodársky rast)
OPE	Operational Programme 'Education' (Operačný program Vzdelávanie)
OPRD	Operational Programme 'Research and Development' (Operačný program Výskum a vývoj)
R&D	Research and development
RDA	Research and Development Agency (Agentúra pre výskum a vývoj)
R&I	Research and innovation
RIS3	Research and Innovation Strategies for Smart Specialisation
RNP	Research Networking Programmes
RTDI	Research Technological Development and Innovation
SAS	Slovak Academy of Sciences (Slovenská akadémia vied)
SF	Structural Funds
SIEA	Slovak Innovation and Energy Agency (Slovenská inovačná a energetická agentúra)
SME	Small and Medium Sized Enterprise
SRGBST	Slovak Republic Government Board Council for Science, Technology and Innovation (Rada vlády SR pre vedu, techniku a inovácie)
SRDP	State Research and Development Programmes (Štátne programy výskumu a vývoja)
S&T	Science and technology
VEGA	VEGA grant agency (Grantová agentúra VEGA)
VC	Venture Capital

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